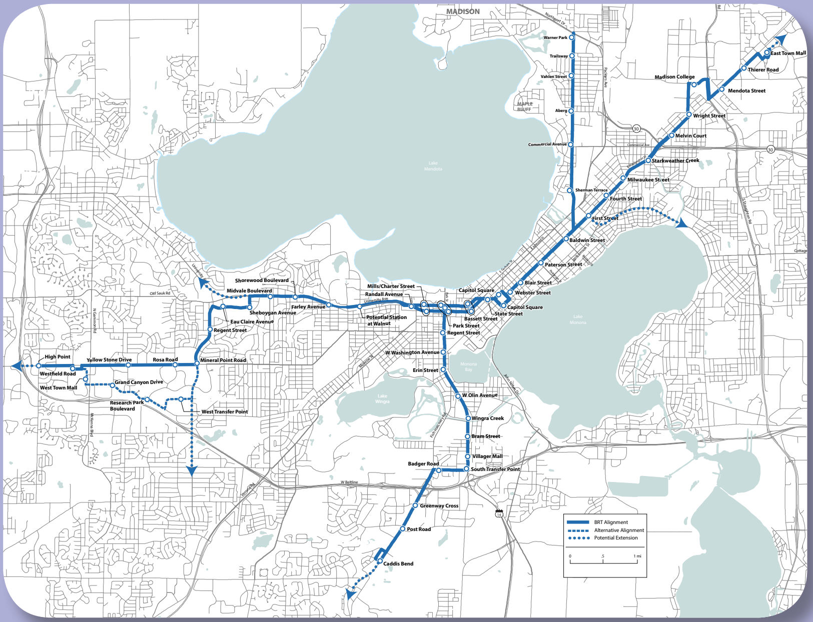
Madison Transit Corridor Study

Investigating Bus Rapid Transit in the Madison Area



A Study By

The Capital Region Sustainable Communities Initiative

Capital Region Sustainable Communities

The Madison Area Transportation Planning Board

Madison Area
T • P • B
Transportation Planning Board
A Metropolitan Planning Organization (MPO)

MAY 2013

CAPITAL REGION SUSTAINABLE COMMUNITIES INITIATIVE

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Investigating Bus Rapid Transit in the Madison Area

May 2013

Prepared by the
SRF Consulting Group Team

Table of Contents

Study Process **1**

Study Sponsor *3*

Oversight Committee *4*

Project Approach *5*

Public Involvement *6*

Transit Corridor Study Goals *7*

Universe of Corridors *7*

Refinement of Initial Alternatives *7*

BRT Components **11**

Service *14*

Runningways *14*

Stations *16*

Transfer Points *21*

Commuter Express Routes and Park and Ride Lots *21*

Vehicles *24*

Route Structure *25*

Fare Collection *28*

Transit Signal Priority (TSP) *28*

Branding *30*

Analysis Methods **31**

Capital Costs *31*

Runningway Treatment *31*

BRT Station Cost Estimates *32*

Vehicles *33*

Right-of-way *33*

Professional Services *33*

Allocated Contingencies *33*

Unallocated Contingencies *34*

BRT Vehicle Storage and Maintenance *34*

Operating and Maintenance (O&M) Costs *34*

Ridership Forecasts *35*

Redevelopment Potential and Transit Oriented Development (TOD) Factor *36*

Madison BRT Corridors **37**

The Central Segment *37*

West Corridor – Mineral Point Road *39*

West Corridor – Odana Road *48*

South Corridor *54*

East Corridor *61*

North Corridor *68*

Corridor and System Summary **76**

Evaluation of Project Goals **84**

Goal 1: Reduce Travel Times *84*

Goal 2: Attract New Transit Riders *84*

Goal 3: Improve connections between low income and/or transit dependent neighborhoods and centers of employment and activity *85*

Goal 4: Provide expanded carrying capacity *88*

Goal 5: Improve operational efficiencies *90*

Goal 6: Provide an enhanced image for transit service *91*

Goal 7: Improve the comfort and convenience of the transit experience *91*

Goal 8: Integrate well with the existing and planned transit system *93*

Goal 9: Enhance opportunities for transit-oriented development (TOD) *93*

Madison BRT: Next Steps 95
Identification of BRT Stages 95
Detailed Design and Environmental Analysis 95
Funding 95
Community Engagement 96
BRT Supportive Policies 96
Branding 97
Transit Signal Priority 97
Local Bus System Redesign and Transit Facilities 97
Transit Operations 98
Sustainable Communities Planning 98
Potential Future Extensions 98

Appendices (under separate cover)

Appendix A: Public Involvement Plan
Appendix B: Public Meeting 1 & 2 Summaries
Appendix C: Universe of Alternatives Initial Review
Appendix D: Proposed BRT Travel Time Estimation Approach
Appendix E: Station Site Review Methodology
Appendix F: Station Sizing and Siting Graphics
Appendix G: Station Sizing Table
Appendix H: Station Review Table
Appendix I: Proposed BRT Operations Plans
Appendix J: TSP Slack Time Analysis
Appendix K: Capital Costs Estimates
Appendix L: O&M Cost Estimates
Appendix M: Infill and Redevelopment Assessment
Appendix N: Walnut Street Station Constraints
Appendix O: Corridor Cross Sections

Tables

Table 1: Oversight Committee 4
Table 2: Proposed System Frequency and Span of Service 14
Table 3: BRT Vehicle Characteristics 25
Table 4: Local Bus Service Modifications – Potentially Affected Routes 27
Table 5: Summary of Madison BRT Component Assumptions 30
Table 6: Professional Service Assumptions 33
Table 7: West Corridor - Mineral Point Runningway Lengths 39
Table 8: West Corridor - Mineral Point Stations 41
Table 9: West Corridor – Mineral Point Road Travel Time Estimates 43
Table 10: West Corridor – Mineral Point Road Intersections Recommended for Further Consideration of TSP 44
Table 11: West Corridor Mineral Point – Affected Local Routes 45
Table 12: West Corridor Mineral Point – Proposed Operational Changes to Affected Local Routes 45
Table 13: West Corridor - Mineral Point Road - Capital Costs 46
Table 14: West Corridor Mineral Point - Annual Operating and Maintenance Costs (2012$) 46
Table 15: West Corridor Mineral Point - Daily Ridership 47
Table 16: West Corridor Odana Road - Runningway Lengths 48
Table 17: West Corridor - Odana Road Station Characteristics 49
Table 18: West Corridor – Odana Road Travel Time Estimates 50

Table 19: West Corridor - Odana Road Intersections Recommended for Further Consideration of TSP..............................51
Table 20: West Corridor - Odana Road Capital Costs..............................52
Table 21: West Corridor - Odana Road Operating and Maintenance Costs..............................53
Table 22: West Corridor - Odana Road Ridership..............................53
Table 23: South Corridor Runningway Lengths..............................54
Table 24: South Corridor Station Characteristics..............................56
Table 25: South Corridor Travel Time Estimates..............................57
Table 26: South Corridor - Intersections Recommended for Further Consideration of TSP..............................58
Table 27: South Corridor – Affected Local Routes..............................58
Table 28: South Corridor - Proposed Operational Changes to Affected Local Routes..............................59
Table 29: South Corridor Capital Costs..............................60
Table 30: South Corridor Operating and Maintenance Costs..............................60
Table 31: South Corridor Daily Ridership..............................60
Table 32: East Corridor Runningway Lengths..............................61
Table 33: East Corridor Station Characteristics..............................63
Table 34: East Corridor Travel Time Estimates..............................64
Table 35: East Corridor Intersections Recommended for Further Consideration of TSP..............................64
Table 36: East Corridor – Affected Local Routes..............................65
Table 37: East Corridor - Proposed Operational Changes to Affected Local Routes..............................65
Table 38: East Corridor Capital Costs..............................66
Table 39: East Corridor Operating and Maintenance Costs..............................67
Table 40: East Corridor Daily Ridership..............................67
Table 41: North Corridor Runningway Lengths..............................68
Table 42: North Corridor - Shelter Characteristics..............................70
Table 43: North Corridor Travel Time Estimates..............................72
Table 44: Intersections Recommended for Further Consideration of TSP..............................72
Table 45: North Corridor – Affected Local Routes..............................73
Table 46: North Corridor - Proposed Operational Changes to Affected Local Routes..............................73
Table 47: North Corridor Capital Costs (2016$)..............................74
Table 48: North Corridor - Annual Operating and Maintenance Costs (2012$)..............................74
Table 49: North Corridor - Daily Ridership Projections..............................75
Table 50: Corridor Attributes..............................76
Table 51: Corridor Travel Times..............................77
Table 52: Capital Costs..............................78
Table 53: Corridor BRT O&M Costs (2012$)..............................79
Table 54: O&M Costs for Local Bus Service Changes (2012$)..............................80
Table 55: Corridor Ridership Projections..............................81
Table 56: System Summary – Capital Costs..............................82
Table 57: System Summary – Annual Operating and Maintenance Costs..............................83
Table 58: System Summary – Annual System Ridership Projections..............................83
Table 59: Travel Time Savings..............................84
Table 60: New Transit Riders - Daily Ridership..............................85
Table 61: Low Income/Transit Dependent Origin Destination Pairs..............................86
Table 62: Existing versus Proposed Passenger Capacity per Hour..............................89
Table 63: Commonly Overcrowded Routes..............................90
Table 64: Local Peak Frequencies versus Proposed BRT Frequencies..............................92
Table 65: Evaluation Summary..............................94

Figures

Figure 1: Metro Transit Annual Fixed Route Ridership 1970 – 2011..............................1
Figure 2: Project Approach..............................5
Figure 3: Initial Universe of Corridors..............................8

Figure 4: Route 57 Travel Time Analysis 12
Figure 5: BRT Component Summary 13
Figure 6: Median Busway Cross Section 15
Figure 7: Side Running Lane Cross Section 16
Figure 8: Constrained Small Station - Plan View 17
Figure 9: Unconstrained Medium Station - Plan View 17
Figure 10: Constrained Station - Section View 18
Figure 11: Unconstrained Station - Section View 18
Figure 12: Station Configuration Advantages and Disadvantages 19
Figure 13: Proposed Station Amenities 20
Figure 14: Potential Transfer Point Configuration 22
Figure 15: Potential Express Commuter Routes and Park and Ride Locations 23
Figure 16: BRT Vehicle, Seattle, Washington 24
Figure 17: BRT Vehicle, Snohomish County, Washington 24
Figure 18: Proposed BRT Service and Existing Local Bus Service 26
Figure 19: Central Segment 37
Figure 20: Madison BRT System – Proposed System 38
Figure 21: West Corridor Runningway Types and Station Locations 40
Figure 22: Campus Drive and Walnut Street 42
Figure 23: West Transfer Point Potential Relocation Area 43
Figure 24: University Avenue Fixed Guideway Impacts 47
Figure 25: South Corridor Runningways and Station Locations 55
Figure 26: Potential Relocation Area for the South Transfer Point 57
Figure 27: East Corridor Runningways and Station Locations 62
Figure 28: North Corridor Runningway Types and Station Locations 69
Figure 29: Potential North Transfer Point Relocation Area 71
Figure 30: Low Income/Transit Dependent Origin Destination Pair Locations 87

Study Process

The Madison metropolitan area has grown substantially in recent years, placing pressure on the transportation system and prompting conversations about high-capacity transit. Over the last 30 years, the greater Madison community has invested time, effort, and resources discussing the potential for possible solutions, including light rail, commuter rail, and a streetcar system. Through the course of these studies, bus rapid transit (BRT) solutions have been considered, but never analyzed in great depth.

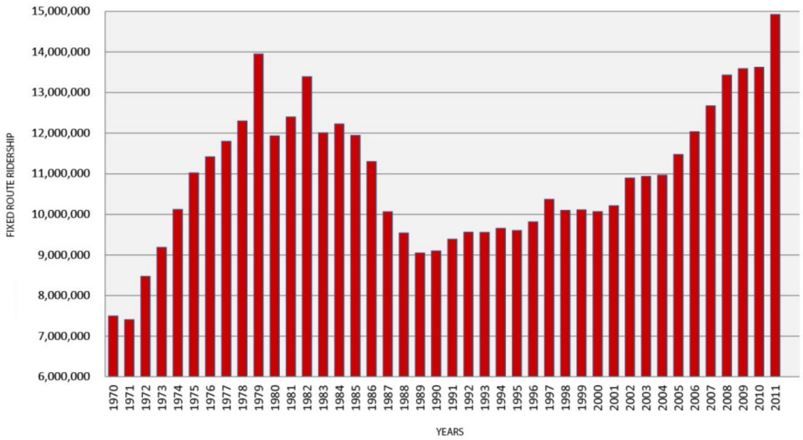
The Madison area’s primary transit system, Metro Transit, has seen significant increases in ridership starting in 2003, as shown in Figure 1. With these increases in ridership, Metro has experienced overcrowding, particularly on the lines that serve UW Madison and Madison College, often resulting in the need to add additional buses. For example, Metro buses’ seating capacity is 34 to 38. A crowded bus is generally defined as having 15 to 20 riders standing. Some bus trips have chronic overcrowding problems with passenger counts as high as 65 or more.

With continued urban growth comes longer transit trips. In many cases, people are making trips across Madison to access jobs, schools, and other destinations. These trips may take well over an hour and involve one or more transfers. Long, regional trips using core bus routes often make many stops, use low-speed neighborhood streets, and take riders on circuitous deviations.

While a positive sign that the community is availing itself of the transit system, the overcrowding and associated operational issues negatively impact customer satisfaction. The overcrowding, in particular, is a strong indication that Madison is in need of improved service as well as the development of a substantial transit expansion, such as BRT.

Despite these difficulties, in 2012 Madison Metro Transit was awarded the National Outstanding Public Transportation System Award, which is sponsored by the America Public Transportation Association (APTA). Called the “best of the best” in the industry, APTA recognizes its winners as outstanding role models of excellence, leadership, and innovation whose accomplishments have *greatly* advanced public transportation.

Figure 1: Metro Transit Annual Fixed Route Ridership 1970 – 2011



Bus rapid transit (BRT) is a high frequency, limited-stop bus system that is intended to provide faster service and improved reliability in urban environments. BRT service design typically incorporates unique lane treatments to give an advantage to bus service along with transit signal priority, unique station and vehicle designs, and enhanced customer service features to improve service quality. BRT service is most appropriate to consider along high transit utilization corridors serving a number of key travel generators within a community. Implementing BRT is often less expensive and has a shorter timeframe than many other improvements such as rail services.

Over the past 30 years, Madison has conducted a number of studies intended to identify the most promising prospects to provide improved transit service opportunities. The Transport 2020 Alternatives Analysis Study analyzed area hybrid light-commuter rail system from Middleton to east of Madison and a recent effort looked at streetcar system feasibility in the downtown and University of Wisconsin area. None of those earlier efforts looked seriously at the opportunities of providing BRT service although it can offer many similar advantages to rail service such s reduced travel times, greater carrying capacity, enhanced image and opportunity for transit oriented development (TOD).

BRT in its highest form can resemble rail service in that it can operate in its own right of way. But BRT has proven flexible enough in recent applications to operate satisfactorily within existing street configurations. In some locations BRT is considered a long-term, permanent transit solution and in others is expected to serve as a precursor to future rail development.

The Madison Transit Corridor Study was intended to evaluate the feasibility of implementing BRT service along arterial street corridors. Four corridors were evaluated in the study: north, south, east and west out of the downtown area that include a common central segment in the UW Campus area and central isthmus. Those corridors are the most heavily traveled transit corridors in the city with over 20,000 of about 60,000 total daily boardings. The purpose of the study was to provide a detailed assessment of arterial BRT service along these corridors by identifying the potential costs to construct and operate the service and estimating how many riders the service might attract. As part of that assessment, considerations for altering the existing transit services had to be incorporated and the location, sizing and operation of timed-transfer points within the system also had to be considered. The most promising segments were identified for initial consideration with longer-term connections and expansions set aside for future consideration.

Both “corridor BRT” - utilization of existing travel lanes or side running non-exclusive bus lanes and “fixed guideway BRT” - creating new guideways - were evaluated where possible. A corridor BRT system would function similar to lower capital cost systems in Seattle, WA; Albuquerque, NM; Nashville, TN; and New York, NY; while a fixed-guideway BRT system would model more intensive infrastructure in Eugene, OR; Cleveland, OH; Miami, FL; and Pittsburgh, PA.

Information from the study is intended to help guide future transit service facilities and land use planning efforts across the community. The study was coordinated with a separate transit-oriented development (TOD) market study that will provide information on meeting regional housing, employment and service needs in pedestrian-friendly transit-supportive developments. The potential ridership increment resulting from TOD along the BRT corridors was incorporated into this study.

Engaging the Greater Madison community in the Madison Transit Corridor Study public involvement process creates linkages between the community and additional planning efforts like the City of

Madison Comprehensive Transportation Master Plan. The City has identified a need for a comprehensive transportation master plan that integrates all modes of passenger and freight transportation (i.e., air, auto, bicycle, freight rail and truck, high-capacity transit, pedestrian, public transportation, etc.), identifies how those modes interconnect, and highlights how the City's numerous plans and policies enhance and support the master plan. Essentially, the Madison Transit Corridor Study will inform the Comprehensive Transportation Master Plan. It will also inform the future update of the long-range Regional Transportation Plan by the Madison Area Transportation Planning Board – A Metropolitan Planning Organization (MPO).

Study Sponsor

The Madison Transit Corridor Study was undertaken by a partnership of agencies, including:

- Capital Area Regional Planning Commission (CARPC)
- Madison Area Transportation Planning Board (TPB) – An MPO
- City of Madison
- Dane County
- Madison Area Transportation Planning Board/Metropolitan Planning Organization (MPO)
- Metro Transit

Funding for the project was provided through a Sustainable Community Regional Planning Grant (SCRPG). As the regional transportation planning body, the MPO was the lead agency for the study.

The Capital Region Sustainable Communities Consortium (CRSCC) of government, business and nonprofit organizations, which is led by the Capital Area Regional Planning Commission (CARPC), received a Sustainable Community Regional Planning Grant (SCRPG) from the US Department of Housing and Urban Development (HUD). A major goal of the three-year grant project is to create a broad partnership to advance regional sustainable development and promote shared goals and performance targets in local and regional plans. Among the activities of the Sustainable Communities project is to develop plans for improved regional transit and transit-supportive development that increases connections between residents, including low-income and those more reliant on transit services, and employment centers.

One of the goals of the CRSCC partnership is to increase equity in planning and decision-making. The workgroup responsible for advancing this goal seeks to integrate social equity into all aspects of the partnership's work, including this transit study. They propose that "equity" means just and fair inclusion that enable all residents to access and take advantage of the region's economic, social and environmental assets. While this study is meant to focus on technical recommendations, issues of equity and inclusion were identified and considered wherever possible.

Oversight Committee

The study was guided by a 20-person advisory committee that provided technical direction. The committee was comprised of representatives from the MPO Policy Board and staff, Capital Area Regional Planning Commission, the Cities of Madison and Fitchburg, UW-Madison, Wisconsin Department of Transportation, Dane County, MPO board members and MPO staff, and other agencies and organizations. Members of the committee are presented in Table 1.

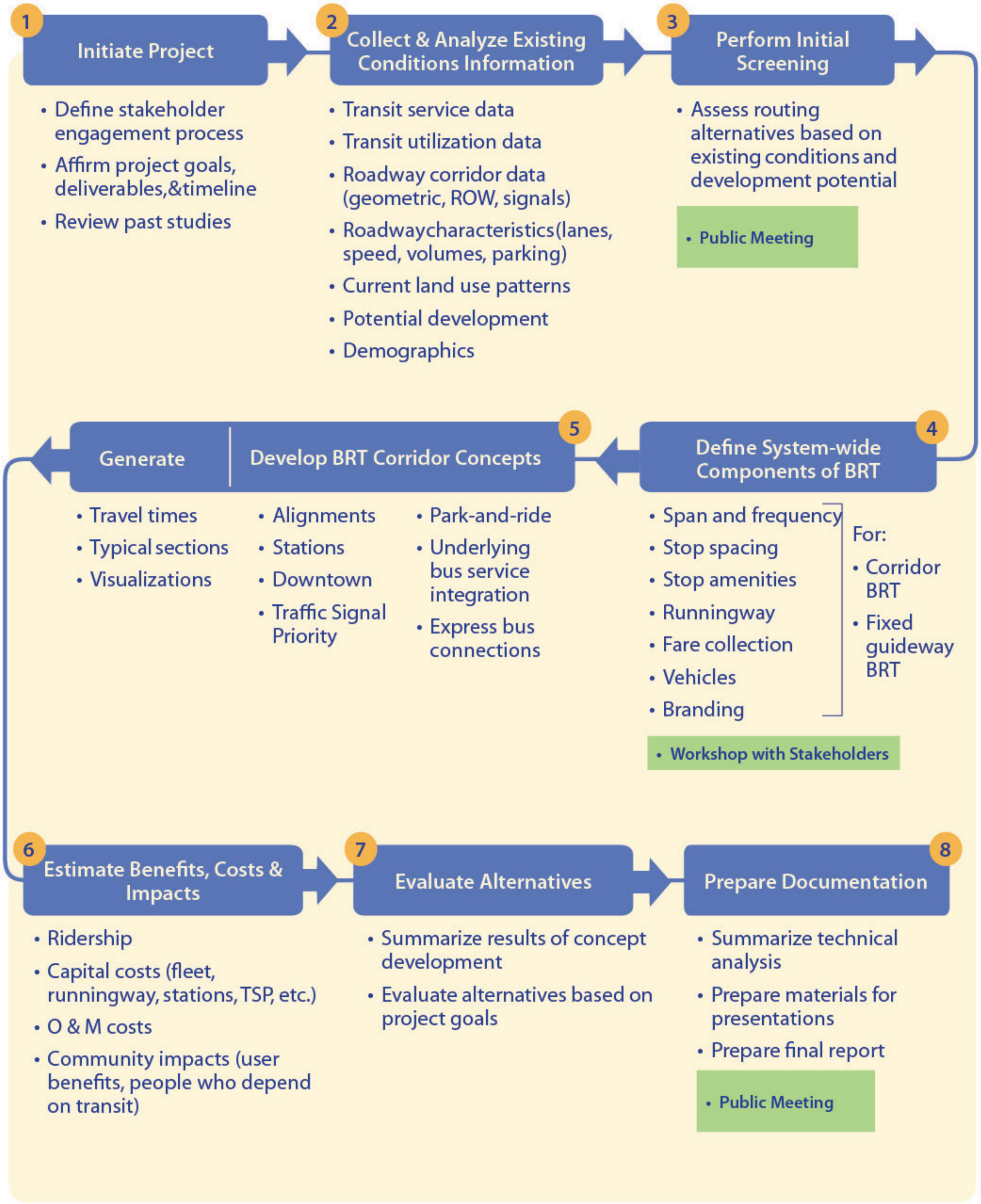
Table 1: Oversight Committee

Name	Organization/Affiliation
Bill Schaefer	Madison Area TPB (MPO) Staff
Mike Cechvala	Madison Area TPB (MPO) Staff
Mark Opitz	MPO Policy Board
Steve Steinhoff	Capital Area Regional Planning Commission
Chuck Kamp	City of Madison Metro Transit
Drew Beck	City of Madison Metro Transit
David Trowbridge	City of Madison Planning
Ken Golden	City of Madison Transit & Parking Commission
Chris Petykowski	City of Madison Engineering
Dave Dryer	City of Madison Traffic Engineering
Brian Smith	City of Madison Traffic Engineering
Delora Newton	Greater Madison Chamber of Commerce
Bruce Wilson	Madison Area Bus Advocates
Dar Ward	UW-Madison Transportation Services
Pam Dunphy	Dane County Public Works & Transportation
Diane Paoni	Wisconsin Department of Transportation
Michelle Brokaw	Wisconsin Department of Transportation
Ahnaray Bizjak	City of Fitchburg
Susan Schmitz	Downtown Madison, Inc.
Joe Kapper/Ian Ritz	Wisconsin Department of Transportation

Project Approach

The major activities completed for the project are shown in Figure 2.

Figure 2: Project Approach


1
Initiate Project
• Define stakeholder engagement process
• Affirm project goals, deliverables,&timeline
• Review past studies
2
Collect & Analyze Existing Conditions Information
• Transit service data
• Transit utilization data
• Roadway corridor data (geometric, ROW, signals)
• Roadwaycharacteristics(lanes, speed, volumes, parking)
• Current land use patterns
• Potential development
• Demographics
3
Perform Initial Screening
• Assess routing alternatives based on existing conditions and development potential
• Public Meeting
4
Define System-wide Components of BRT
• Span and frequency
• Stop spacing
• Stop amenities
• Runningway
• Fare collection
• Vehicles
• Branding
For:
• Corridor BRT
• Fixed guideway BRT
• Workshop with Stakeholders
5
Generate
Develop BRT Corridor Concepts
• Travel times
• Typical sections
• Visualizations
• Alignments
• Stations
• Downtown
• Traffic Signal Priority
• Park-and-ride
• Underlying bus service integration
• Express bus connections
6
Estimate Benefits, Costs & Impacts
• Ridership
• Capital costs (fleet, runningway, stations, TSP, etc.)
• O & M costs
• Community impacts (user benefits, people who depend on transit)
7
Evaluate Alternatives
• Summarize results of concept development
• Evaluate alternatives based on project goals
8
Prepare Documentation
• Summarize technical analysis
• Prepare materials for presentations
• Prepare final report
• Public Meeting

Public Involvement

The Transit Corridor Study developed a public participation plan in order to engage stakeholders at key points during the study process. The purpose of the public participation process was to educate the community about BRT and the positive impact it can have on city-wide and regional goals for mobility, sustainability, economic development, and environmental justice. The process also provided the community the opportunity to give input on the recommendations of the technical study. The goals of the public involvement plan were:

1. Educate the community about Metro Transit's challenges, including overcrowding, operations, and rising costs, as well as its success in the face of these challenges.
2. Educate the community about BRT – what it is, how it works, and the benefits for residents, employers, current transit users, and the community as a whole in terms of sustainable development, economic development, and quality of life.
3. Seek input from the community in response to the study recommendations for the BRT system in terms of functionality, design, routes, and operations.
4. Lay the groundwork for the strong community support that will be necessary for the implementation of the BRT system.
5. Educate the community about the connection between land use and transit.
6. Ensure the community has confidence in the technical analysis by adequately explaining the process and the outcomes of the analysis.
7. Help the community understand that improved transit service will also improve other modes of travel.

The desired outcome for the public involvement process was to receive useful input and give the public and the Dane County and City of Madison policy-makers confidence in the report. The full public involvement plan can be found in

Appendix A.

The project study area ran through or touched nearly forty neighborhood associations and many of the area business associations. The project management team used the existing communication structures, such as association listservs and websites, to disseminate information about the Transit Corridor Study to all of these groups. Information about the study was also posted on the MPO's website. Additionally, the news media was kept abreast of project news and announcements over the course of the study in order to publicize the study's public meeting dates and locations.

Two public meetings were held for the Transit Corridor Study. The first public meeting for the project drew over 75 community members. Participants at this meeting gave feedback on the initial alignments as well as which BRT amenities they felt were most important to the proposed system. A second public meeting was held, attracting about 65 community members, to present the proposed BRT system and analysis results.

Transit Corridor Study Goals

The Oversight Committee established the following set of goals for BRT implementation in Madison:

1. Reduce transit travel times
2. Attract new transit riders
3. Improve connections between low income and/or transit dependent neighborhoods and centers of employment and activity
4. Provide expanded transit carrying capacity
5. Improve operational efficiencies
6. Provide an enhanced image for transit service
7. Improve the comfort and convenience of the transit experience
8. Integrate well with the existing and planned transit system
9. Enhance opportunities for transit-oriented development (TOD)

The Transit Corridor Study used the goals to evaluate the potential benefits of the proposed BRT corridors.

Universe of Corridors

One of the early steps in the technical analysis of BRT options was to identify the candidate corridors and segments to carry forward into detailed analysis. The set of corridors initially considered is shown in Figure 3. These alignment alternatives cover four corridors, each arranged radially around Capitol Square and oriented towards the North, East, South, and West transfer points. Common to all radial corridors is the Central Segment which spans from the Isthmus and the Capitol Square to the University of Wisconsin campus. Several alternative routings along the main corridors, as well as potential future extensions to Sun Prairie, Monona, Middleton, and Verona were considered in this initial review. The universe of corridors process was meant to encompass all realistic BRT routings. Alternatives were initially developed by MPO staff with additional corridors added by the consultant team and the Oversight Committee.

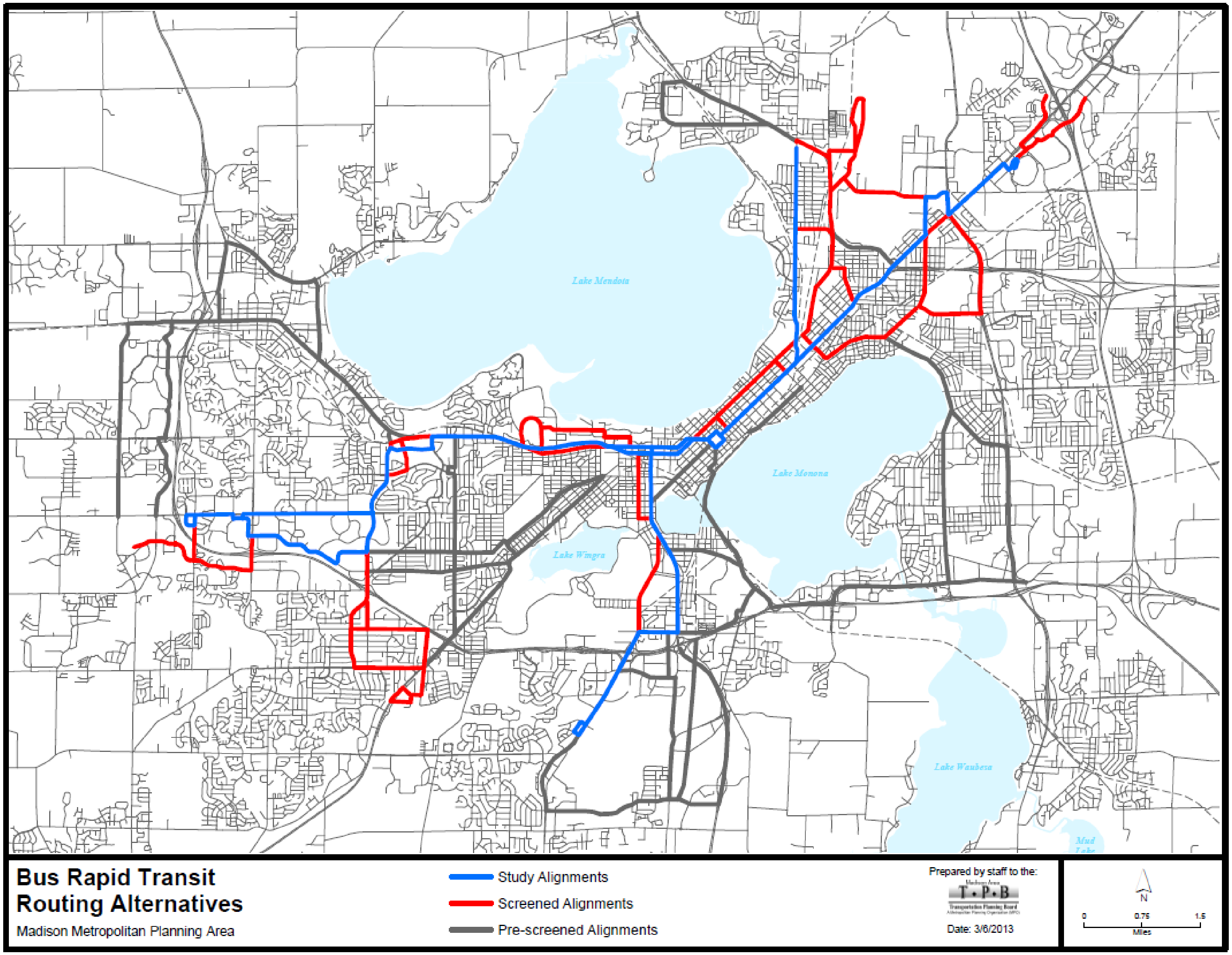
This process selected the most promising corridors from a transit service planning and feasibility standpoint. Corridors such as Middleton, Midvale Boulevard, Monroe Street, the East Rail Corridor, and Monona Drive were not among the most promising at this time. These corridors have insufficient all-day transit ridership or would be impractical to construct and operate.

Refinement of Initial Alternatives

Following the initial screening process, the criteria were used to identify the most promising alignment segments to move forward into detailed study. These metrics were analyzed using GIS and other methods, as described in Appendix C.

- Population within 1/4 mile of the alignments
    - Greater concentrations of population allow routes to operate more productively by serving a larger population with fewer resources.
- Employment within 1/4 mile of the alignments
    - As with population density, a higher concentration of jobs allows transit routes to provide service more effectively.

Figure 3: Initial Universe of Corridors



- Existing transit ridership along the alignments
    - Existing Metro customers represent the current demand for transit service in an area.
- Transit Oriented Development (TOD) potential along route
    - TODs, developments designed and built to encourage transit use, increase demand for—and are benefitted by—high quality transit along a corridor.
- Roadway Suitability
    - The functional class of a roadway as well as speed, right of way/street width, and traffic volumes all effect the implementation of BRT system.

The corridors and segments advanced for detailed review are shown in blue and labeled “Study Alignments” on Figure 3. Some alternatives and segments, such as in the downtown area, were not fully studied at this time due to their complexity and relatively small impact on the system as a whole. Some of these may merit further review in the future.

West Corridor

In the University Avenue corridor, four sub-alternatives were developed between Farley Avenue and Randall Avenue: direct service via Campus Drive, via University Bay Drive and Campus Drive, via “Old” University Avenue, and via University Bay Drive and “Old” University Avenue. Including University Bay Drive and/or “Old” University Avenue in the alignment increases travel times by an estimated two to five minutes, subjects riders to circuitous routing, and introduces substantial reliability concerns, particularly on “Old” University Avenue. The direct route via Campus Drive was advanced because it was the only one that satisfied the project goals to reduce travel times, improve the comfort and convenience of the transit experience, and integrate well with the existing and planned transit system.

In the Hill Farms area, transit service currently operates from University Avenue to Whitney Way via a circuitous path involving Segoe Road, Sheboygan Avenue, Eau Claire Avenue, and Regent Street. Two sub-alternatives to this routing were evaluated, via Sheboygan Avenue (eliminating Eau Claire Avenue and Regent Street) and via Old Middleton Road. The current alignment via Eau Claire Avenue and Regent Street was dismissed because of circuitous routing and reliability concerns from Metro Transit. The Old Middleton Road alignment would be the fastest, most direct path, but the travel time savings would likely be less than a minute on average. This alignment substantially degrades service to the Hill Farms neighborhood centered on Sheboygan Avenue which has over 1,000 daily boardings, likely failing the project goals of providing expanded carrying capacity and improving operational efficiencies.

West of Whitney Way, two alternatives were evaluated for the west corridor, via Mineral Point Road and via Odana Road. The Mineral Point Road alternative requires the relocation of the West Transfer Point to the north near Mineral Point Road. However, this change moves the West Transfer Point away from an activity center with a grocery store (Westgate mall) to an area that is primarily open space (if a suitable site can be found) and relocates the West Towne Mall stop to the north of the ring road, away from the main mall entrance. In contrast, the Odana Road alternative serves the West Transfer Point at or near its existing location and serves West Towne Mall at the existing bus stop near its front entrance. However, it is about two minutes slower, more circuitous, and does not serve residential areas near Mineral Point Road and Yellowstone Drive. These two alternatives demonstrate the trade-off between different project goals, such as reducing travel times, providing an enhanced image for transit service (Mineral Point Road), improving connections between low income and/or transit dependent neighborhoods and centers of employment and activity, integrating well with the existing and planned transit system, and enhancing opportunities for transit oriented development (Odana Road). As a result, both alignments were analyzed in the study, and future planning efforts will need to determine which moves forward.

South Corridor

The number of viable alignment alternatives in the south corridor is limited by the geography of the area which is bounded by the Arboretum to the west, Lake Monona to the east, and the Nine Springs Greenway to the southeast. The study alignment on Park Street matches that of the streetcar planning work completed in 2007. Alternative alignments on Fish Hatchery Road, John Nolen Drive, and West Washington Avenue were found to have insufficient ridership, circuitous routing, or both.

East Corridor

The number of viable alignment alternatives in the east corridor is limited by the relative lack of radial arterial streets serving transit supportive land uses like East Washington Avenue. BRT in the east corridor is anticipated to save about three to four minutes from Metro Transit’s current Route 6 via Madison College by cutting off the Kinsman Boulevard deviation and being routed via Anderson Street. A further potential improvement in route directness was identified by travelling between Stoughton Road and East Washington Avenue via Mendota Street or a new street connection between Anderson Road and Lien Road. Specific routing options in this area are dependent on the Stoughton Road corridor study. Eliminating the Madison College deviation altogether would result in the fastest possible service (saving three additional minutes over Anderson Street); however, this alignment would likely not generate sufficient ridership, nor ease overcrowding on Route 6.

The east corridor is the only corridor that does not directly serve a transfer point. Additional corridors between the Capitol Square and East Towne were considered in the universe of corridors review that would serve the East Transfer Point in its existing location or a new location. However, these corridors (Fair Oaks Avenue, Milwaukee Street, and Stoughton Road), are circuitous, congested, and/or serve land uses that are not supportive of premium transit service.

North Corridor

Similar to the south corridor, the north corridor has two potential arterial street alignments for BRT, Sherman Avenue and Packers Avenue. Although Packers Avenue is fastest path, it serves land uses that are not supportive of premium transit service, including industrial, suburban office, low-density residential and open space (Demetral Field and Bridges Golf Course). As a result, it would likely not generate sufficient all-day ridership to support BRT. Additionally, a Packers Avenue alignment would likely require BRT buses to exit at Aberg Avenue, serve the North Transfer Point, and reenter Packers Avenue, eliminating most or all of its travel time advantages. Sherman Avenue was identified as the best alignment to study as it serves transit supportive land uses (Sherman Terrace, Maple Woods, and multi-family buildings on Trailsway) as well as areas that may be candidates for transit-oriented urban development. The Sherman Avenue alignment requires the relocation of the North Transfer Point from Huxley Street to near Sherman Avenue, bringing it closer to a more pedestrian-oriented activity center with retail and potential redevelopment opportunities.

Between the Capitol Square and the Fordem Avenue / Johnson Street intersection, BRT could follow East Washington Avenue or the Johnson Street and Gorham Street couplet. East Washington Avenue was chosen because it would unify the regional BRT service onto one corridor, support planned high densities along East Washington Avenue, and not be subject to traffic delays on Johnson and Gorham Streets, which are not good candidates for BRT treatments such as dedicated lanes and in-lane stops. To maximize BRT speeds, the East Washington Avenue alignment would benefit from a connection to Fordem Avenue. One option for this connection is a new 0.3-mile busway along the railroad corridor crossing the Yahara River, informally referred to as the Yahara Busway. Alternatives with the East Washington Avenue routing (Baldwin Street, First Street, Commercial Street, Aberg Avenue, and Anderson Street) are circuitous (likely taking more time than Route 2), duplicative of the east corridor, and/or use local residential streets. The Yahara Busway would substantially improve reliability by avoiding congested intersection approaches on First Street and at Johnson Street and Fordem Avenue.

The north corridor was initially considered to serve the Dane County Airport via Darwin Road. However, this part of the BRT alignment was not advanced for detailed study due to low existing ridership at the airport, currently only about 15 boardings per weekday. Conversely, extending the BRT line to the northwest would serve substantially more people; however, the only viable service pattern – a loop via Troy Drive and Northport Drive similar to Route 22 – is not conducive to BRT service patterns with limited or substantially consolidated stops, and the land uses do not support the frequent all-day service. As a result, the formal north corridor was ended near Northside Town Center just south of Northport Drive. From that point BRT service splits to provide lower frequency service to both the Troy Drive and Northport Drive area and to Dane County Airport. Besides providing one-seat rides to and from these areas at appropriate frequencies, this service design eliminates the duplication between Route 22 and BRT on North Sherman Avenue. A new terminal would need to be constructed near Northside Town Center to accommodate a layover. Ideally this terminal would also serve the Northside Towne Center park-and-ride.

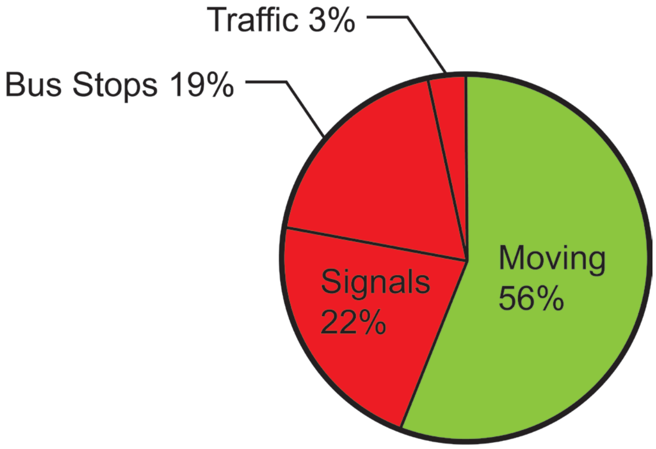
BRT Components

BRT is a corridor-based transit improvement designed to provide fast, frequent, reliable and comfortable service. The key design components, shown in Figure 5, which can affect the overall performance of BRT are:

- Service frequency
- Alignment runningway
- Station location and design
- Vehicles
- Connecting and parallel local bus service
- Fare collection
- Advanced technology
- Identity and branding

Transit travel times, in general, are long because buses are stopped for a great deal of the time they are in service. Often most the delay is not caused by traffic congestion, but rather by waiting at traffic lights and waiting for passengers to board and pay their fares. To illustrate this, a travel time analysis was done during a typical trip on Metro's Route 57, a commuter route with some express service that closely resembles the west corridor BRT line. Almost half of the travel time from the Capitol Square to the West Transfer Point was spent serving bus stops or waiting at traffic signals, as shown in Figure 4. Routes without express service likely spend more time at bus stops. BRT looks to reduce these delays by offering off-board fare collection, limiting the number of stations, and by implementing transit signal priority.

Figure 4: Route 57 Travel Time Analysis



Note: Route 57, Capitol Square to West Transfer Point, October 15, 2012, 4:22 to 4:48 p.m. Normal weather, loading, and traffic conditions were observed. Average penalties for acceleration and deceleration were estimated at 8 seconds per stop.

Figure 5: BRT Component Summary

BRT Components

Service

BRT service typically runs every 15 minutes or better, throughout most of the weekday and on weekends.

Runningways

BRT can use dedicated or preferential lanes to allow buses to move more quickly through traffic. Runningways significantly impact travel speeds, reliability and identity in a system. Minor intersection treatments can make a big difference in a mixed traffic environment

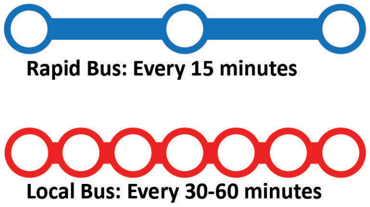
Stations

Bus stops are often upgraded to premium transitway stations with enhanced amenities and information kiosks. BRT Stations can be simple or complex, but they offer passengers increased comfort, safety, and security.

Vehicles

BRT vehicles should have a unique look distinct from regular local and express service and could be hybrid or alternative fuels.

Route Structure

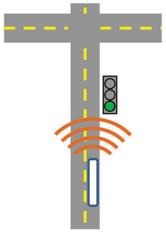


Stations are spaced at similar distances to LRT stops, generally one stop every half mile, to provide express service. Local bus service, with stops spaced generally every quarter-mile, can be maintained along a BRT route.

Fare Collection

Innovative fare collection methods such as electronic pre-pay smartcards and pre-payment kiosks allow for off-board fare collection to speed boarding and increase convenience.

Transit Signal Priority



ITS components such as transit signal priority and real-time arrival signs make the system faster, more reliable, and more user-friendly.

Branding

A system brand is developed to differentiate BRT transitways from other transit service.

Service

BRT service relies on high frequency operation as a key attractor. Frequent service is typically defined as 15 minutes or less of wait time between BRT vehicles. Frequent service means customers can rely on the system to take them where they need to go without consulting complicated schedules and without fear of missing a bus. A service can be fast, but it must also be frequent in order for customers to feel like it is a dependable transportation option for their everyday activities.

The BRT operating plan defines how many buses will serve each stop per hour and the system's operating hours; in transit planning terms this is the system's frequency and span of service. These operating components determine the number of buses needed to support the system in each corridor. Table 2 shows the assumed frequency and span of service for the Madison BRT system analyzed in this study.

Table 2: Proposed System Frequency and Span of Service

Day of Week	Time Period	Hours	Service Frequency
Weekday	Early AM	5:00-6:00 a.m.	30 min.
	AM Peak	6:00-9:00 a.m.	10 min.
	Midday	9:00 a.m.-3:00 p.m.	15 min.
	PM Peak	3:00 p.m.-6:00 p.m.	10 min.
	Evening	6:00 p.m.-12 Midnight	30 min.
Saturday	Morning	7:00-9:00 a.m.	30 min.
	Midday	9:00-6:00 p.m.	15 min.
	Evening	6:00-11:00 p.m.	30 min.
Sunday	Morning	7:00-9:00 a.m.	30 min.
	Midday	9:00-6:00 p.m.	30 min.
	Evening	6:00-11:00 p.m.	30 min.

Runningways

BRT can operate in a dedicated bus-only fixed guideway or share the roadway with other vehicles as necessary. The options considered for the Madison corridors are as follows:

Median Busway:

Buses run in a median running lane constructed for transit use only. Platforms at station locations are typically provided as part of this runningway configuration. Depending on the intersection layout and available space, the platforms may be a single center platform or two right-side platforms. A typical median busway cross section is shown in Figure 6.

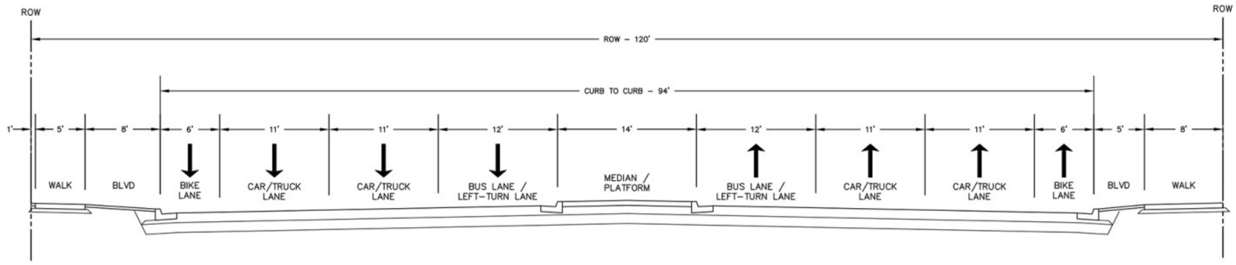
Advantages:

- Buses are not delayed by traffic congestion, including from bikes and turning traffic, which are allowed to use side running lanes
- Fixed guideways create a sense of physical permanency similar to a rail line, which is more visible to potential transit riders and more conducive to transit oriented development.

Disadvantages:

- Fixed guideways are expensive to construct, potentially requiring the purchase of new right-of-way and the rebuilding of entire street cross sections.
- Occasionally requires the purchase of additional right-of-way along an alignment
- Potentially displaces street parking
- Intersections become more complex with left turn movements conflicting with bus movements, with potentially significant reductions to corridor capacity.
- Standard buses that make more frequent stops and/or don't have left-side doors are not able to use the busway.

Figure 6: Median Busway Cross Section



Examples include: Franklin Boulevard, Eugene, OR; Casino Center Boulevard, Las Vegas, NV; and Euclid Avenue, Cleveland, OH.

Side Running Lanes:

BRT vehicles run in a lane reserved for buses and bicyclists. The lane runs on the outermost side of the street closest to the curb. Other traffic is allowed to use the lane to make right turns. This study assumed Side Running Lanes would be painted red and stamped with "Bus and Bike Only" legends. A typical side running lane cross section is shown in Figure 7.

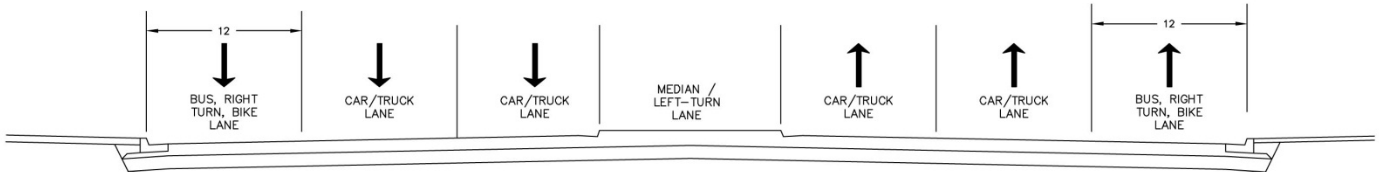
Advantages:

- Decreases delays caused by traffic congestion.
- Cost effective, side running lanes utilize existing roadways and require changes to pavement markings.

Disadvantages:

- Potential reduction in roadway capacity.
- Buses can be delayed by right turning vehicles, bicycles, loading activities, or illegally parked cars
- Can be difficult to enforce

Figure 7: Side Running Lane Cross Section



Examples include: University Avenue (through the UW campus), Mineral Point Road, and the Capitol Square.

Mixed Traffic:

BRT vehicles share lanes with other traffic. Spot improvements, such as queue jumps, through movements from right-turn lanes, parking restrictions, and minor traffic signal changes, may be used reduce delay at pinch points.

Advantages:
- No runningway construction costs

Disadvantages:
- BRT vehicles slowed by traffic congestion and parked vehicles
- Does not project a sense of permanence

Example BRT systems that operate primarily in mixed traffic include RapidRide (Seattle, WA), MetroRapid (Los Angeles, CA), and BusPlus (Albany, NY).

For this study, each corridor was evaluated for the potential to incorporate a median busway or side running lanes. Where those conditions were not possible, it was assumed BRT would operate in mixed traffic. Potential concepts for spot improvements were not evaluated.

The runningway option identifies the investment level for this study. The Corridor BRT alternatives use a combination of mixed traffic and side running lanes. The Fixed Guideway BRT alternatives use a combination of all three.

Stations

BRT stations can range from simple to expansive depending on local needs. Providing appropriately-sized waiting areas with some levels of customer information and amenities are highly desirable to attract and retain new riders who are unfamiliar with the bus system. Locating the station along the runningway is highly dependent on existing space availability.

The Transit Corridor Study assigns one of three station sizes, small, medium, or large, to each station in the system. Station sizes were assigned based on anticipated passenger demand and near term development potential in areas adjacent to the station. Conceptual layouts and station amenities differ depending on station size.

Examples of station constrained and unconstrained configurations are shown in Figure 8 and Figure 9. Figure 10 and Figure 11 show the constrained and unconstrained station views.

The Transit Corridor Study also reviewed all station locations to determine two main configuration characteristics. First, it reviewed the optimum station location in relation to the nearest street intersection (i.e., near side, far side, or mid-block), Figure 12 describes the advantages and disadvantages of near side, far side and mid configurations. In general, Far-side stops are generally preferred for BRT operations because they facilitate transit signal priority and generally work well on higher-speed arterial roadways. Second, it reviewed if the existing conditions allow for a constrained or unconstrained station layout. A constrained station site assumes all station amenities are sited within the existing right-of-way. Unconstrained stations assume the station shelter can be set back behind the existing right-of-way boundary. From a cost estimate perspective, unconstrained stations are more expensive, because they require the acquisition of additional right-of-way. The amenities proposed at each station size are shown in Figure 13.

Figure 8: Constrained Small Station - Plan View

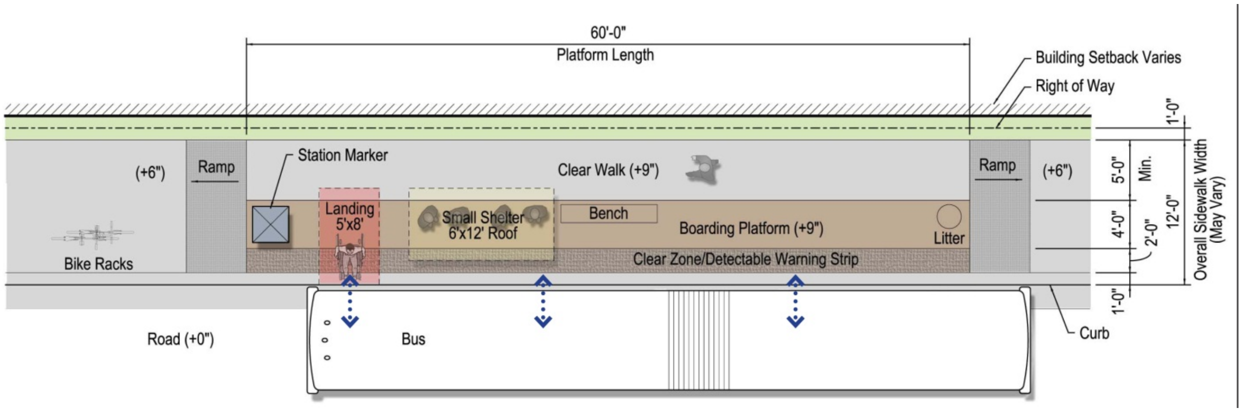


Figure 9: Unconstrained Medium Station - Plan View

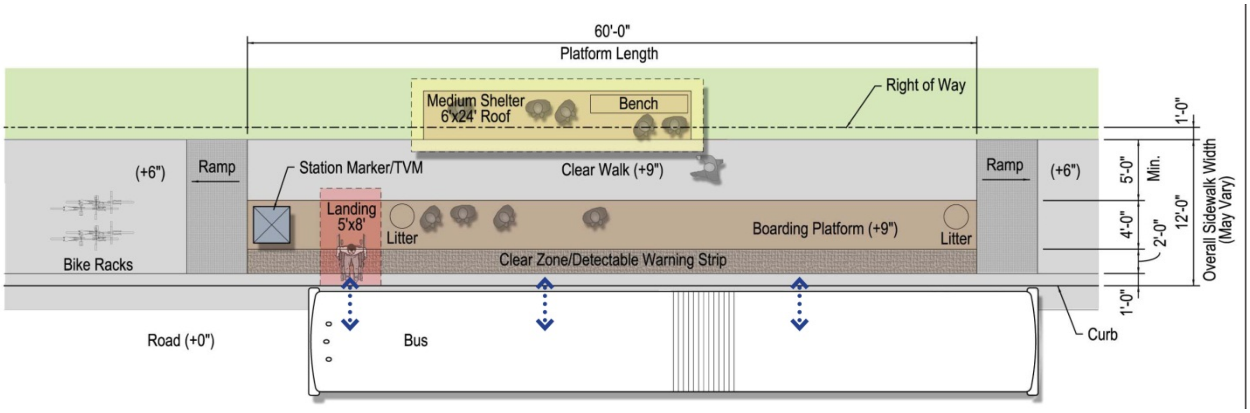


Figure 10: Constrained Station - Section View

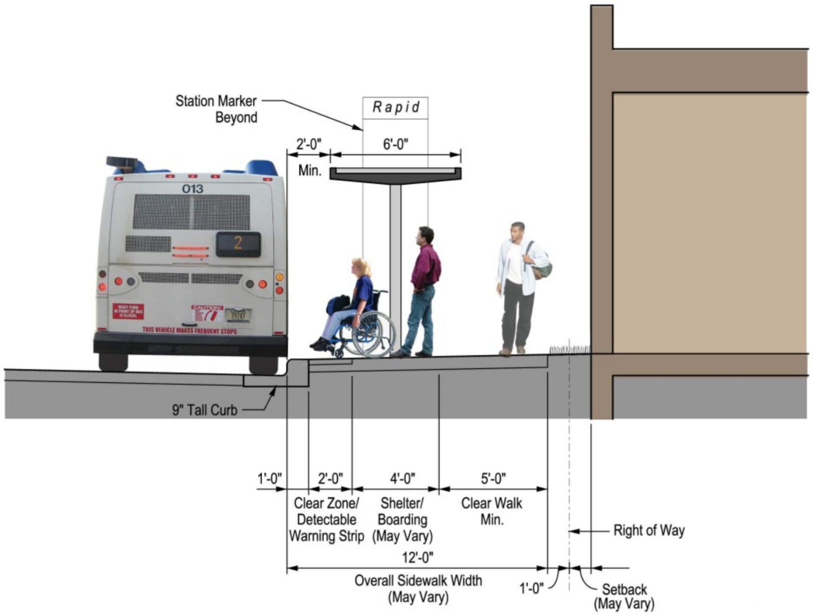


Figure 11: Unconstrained Station - Section View

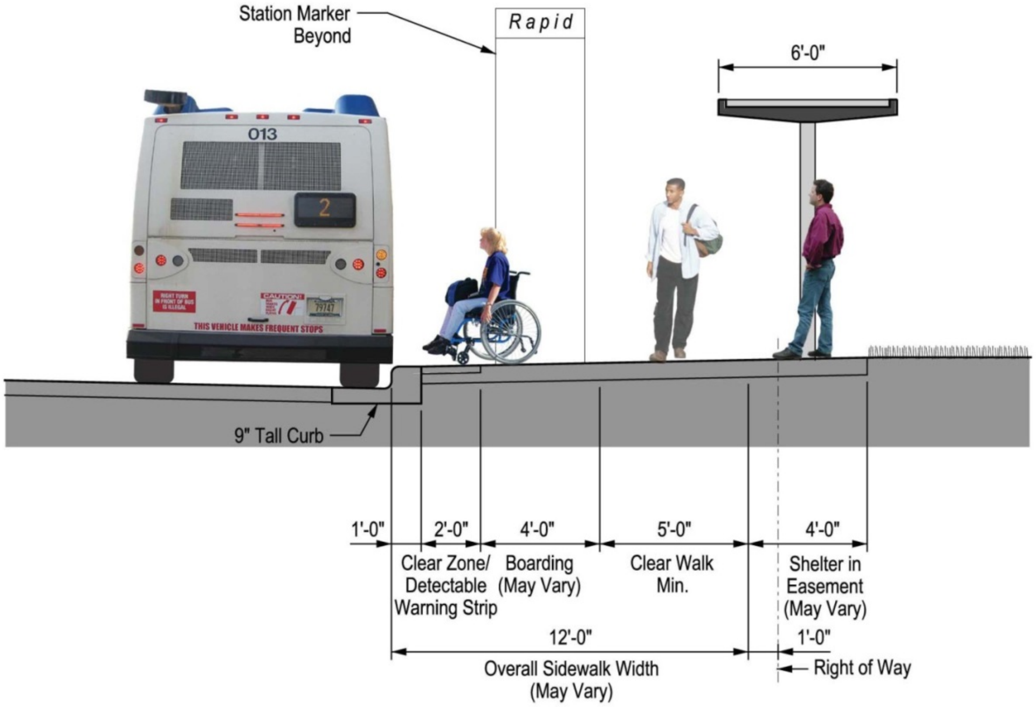


Figure 12: Station Configuration Advantages and Disadvantages

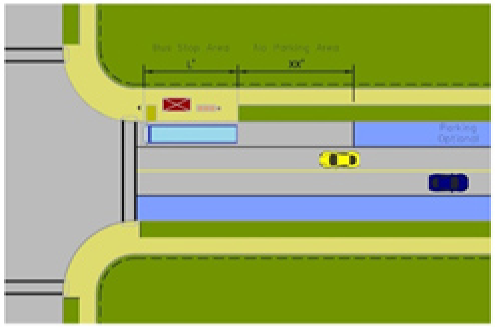
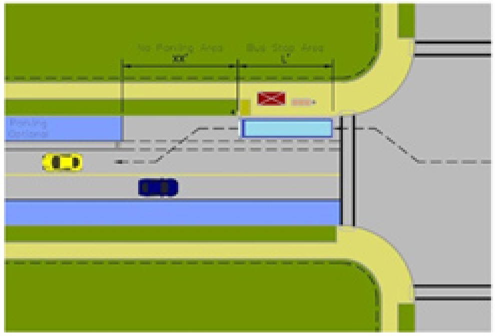
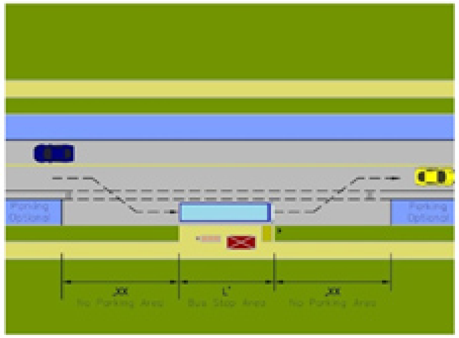
Location	Advantages	Disadvantages	Figure
Nearside	• Allows passengers to access buses close to crosswalk • Intersection width available for bus to pull away from the curb • Eliminates the potential for double-stopping • Allows passengers to board and alight while stopped for a red light • Many existing bus stops are near side, and Metro Transit would not have to establish new ones.	• Increases conflicts with right-turning vehicles • May result in stopped buses obscuring curbside traffic control devices and crossing pedestrians • May cause sight distance to be obscured for side street vehicles stopped to the right of the bus • Increases sight distance problems for crossing pedestrians • Complicated bus signal priority operation, may reduce effectiveness or require a special queue-jump signal if the stop is located in the parking lane or right turn lane • Increases the chances a bus will be stopped during a green light	 Bus Stop Area No Parking Area L' XX' Parking Optional
Farside	• Minimizes conflicts between right turning vehicles and buses • Minimizes sight distance problems on intersection approaches • May encourage pedestrians to cross behind the bus, depending on distance from intersection • Creates shorter deceleration distances for buses, since the intersection can be used to decelerate • Buses can take advantage of gaps in traffic flow created at signalized intersections • Facilitates bus signal priority operation, as buses can pass through intersection before stopping	• May result in intersections being blocked during peak periods by stopped buses • May obscure sight distance for crossing vehicles • May increase sight distance problems for crossing pedestrians • Can cause a bus to stop farside after stopping for a red light, interfering with both bus operations and all other traffic	 No Parking Area Bus Stop Area XX' L' Parking Optional
Midblock	• Minimizes sight distance problems for vehicles and pedestrians • May more effectively serve high-ridership destinations	• Requires additional distance for no parking restrictions • Encourages passengers to cross outside an intersection • Increases walking distance for passengers crossing at intersections	 Parking Optional Parking Optional XX' L' XX' No Parking Area Bus Stop Area No Parking Area

Figure 13: Proposed Station Amenities

		Item	Small	Medium	Large	Notes
1	🟥	Shelter	X	X	X	Primary identity element. Open layout with as few impediments to pedestrian circulation as possible. Modularity desirable. Clear visibility critical.
2	⬜	Security Camera			X	Consistent with system plans.
3	🟪	Static Information Signage	X	X	X	Arterial BRT branding and other passenger information (route identification, system maps, route schedules, etc.)
4	🟪	Dynamic Information Signage		X	X	Consistent with system plans.
5	🟦	Station Marker	X	X	X	Primary identity element in conjunction with shelter. Guide for drivers for stopping location.
6	🟦	Ticket Vending Machine		X	X	Consistent with system plans.
7	🟦	Smart Card Reader	X	X	X	Consistent with system plans.
8	🟦	Bicycle Shelter			X	Overhead shelter to provide weather protection of bike rack area.
9	🟦	Bicycle Racks	X(2)	X(4)	X(6)	Increasing quantities as station size increases.
10	🟦	Bicycle Lockers				Too space consumptive for most on-line station sites but could be considered.
11	🟩	Landscaping	P	P	P	Potential where space permits on a site-specific basis. Low maintenance perennials or shrubs.
12	🟩	Street Trees				Desirable but more appropriately part of a larger streetscape plan.
13	🟧	Bench	P	P	P	More space-efficient seating elements should be considered instead to reduce circulation impediments. Potential where space permits.
14	🟧	Seat Wall/Retaining Wall	P	P	P	Only as required by surrounding grade.
15	⬜	Leaning Rail	X	X	X	Integral with shelter. Less space consumptive than traditional benches.
16	🟫	Litter Receptacles	X(1)	X(2)	X(3)	Increasing quantities as station size increases.
17	🟫	Newspaper Box Corral			X	Desirable where higher passenger volumes may attract more periodicals but kept out of the way as much as possible.
18	🟨	Lighting	X	X	X	Lighting integral with station marker and shelter. Street lightpoles more appropriately part of a larger streetscape plan.
19	🟨	Advertising	P	P	P	Integral with shelter in modular panels on a site-specific basis. Some transparency is desired so visibility is not completely cut off in certain directions.
20	🟧	Heating	P	P	P	Push-button radiant heat is desirable for passenger comfort in cold weather climate. Need to account for electrical load requirements.

X = Item included at station

P = Item potentially provided at station

(1) = Number provided at each station

Transfer Points

During development of the BRT options, it was determined that it would be necessary to relocate several of the existing Metro Transit transfer points to better align with proposed BRT routings. The West – Mineral Point Road Alignment and the North Corridor Alignment options assume the relocation of the West and North Transfer Points respectively. For these alignments it is assumed that all local bus routes serving the West and North Transfer Points will need to be modified to operate to and from the new locations. The Transit Corridor Study also assumes that in order to accommodate the larger BRT vehicles the South Transfer Point will need to be expanded from its current capacity of six 40-foot buses. The East Transfer Point is not served by the BRT system; however, relocating it so that it would be part of the system would place it too close to the North Transfer Point and require substantial restructuring of east Madison service. Several alternatives in the Universe of Corridors present options to include the East Transfer Point in the BRT system, but they were dismissed because of circuitous routing or low ridership potential.

The study does not analyze specific locations for the transfer point relocations/expansions; however the capital cost estimates for each configuration include a cost for the new facilities and required right-of-way. The Transit Corridor Study assumes each new transfer point would require roughly 1.5 acres of land to construct.

During the concept development for the BRT system, several possible transfer point configurations were mentioned. These included locating BRT stations adjacent to the transfer point rather than inside of it in order to reduce delay at the expense of longer distances for people transferring buses. Figure 14 shows a prototypical transfer point design that will accommodate the BRT vehicles and provide space for other local bus service connections as well.

Commuter Express Routes and Park and Ride Lots

The Transit Corridor Study did not analyze in detail how future commuter express routes could interact with the BRT system due to the separate functions of the two systems. Designing regional routes to connect with the proposed BRT system will allow regional commuters – particularly those not traveling to central Madison – to take advantage of the benefits of BRT. Figure 15 shows options for potential express routes throughout Dane County as proposed by the MPO in the Draft 2013-2017 Transit Development Plan. These routes are envisioned to travel through the BRT corridors, stopping at only a few BRT stations to facilitate transfers. They would potentially take advantage of some BRT aspects such as runningway improvements.

The Transit Corridor Study assumes that the existing available parking located at the North Transfer Point will be replaced with the reconstruction of the North Transfer Point near Sherman Avenue. The North Transfer Point is the only transfer point along the proposed corridors that currently offers parking. New park-and-ride facilities are recommended at the outer edges of the West, South, and East corridors in order to increase access to the system. Specific locations are recommended to be identified in future planning efforts. Costs for park-and-ride lots are not included in the cost estimates for the system because of the wide range of arrangements – from low-cost shared retail lots to structured ramps.

Figure 14: Potential Transfer Point Configuration

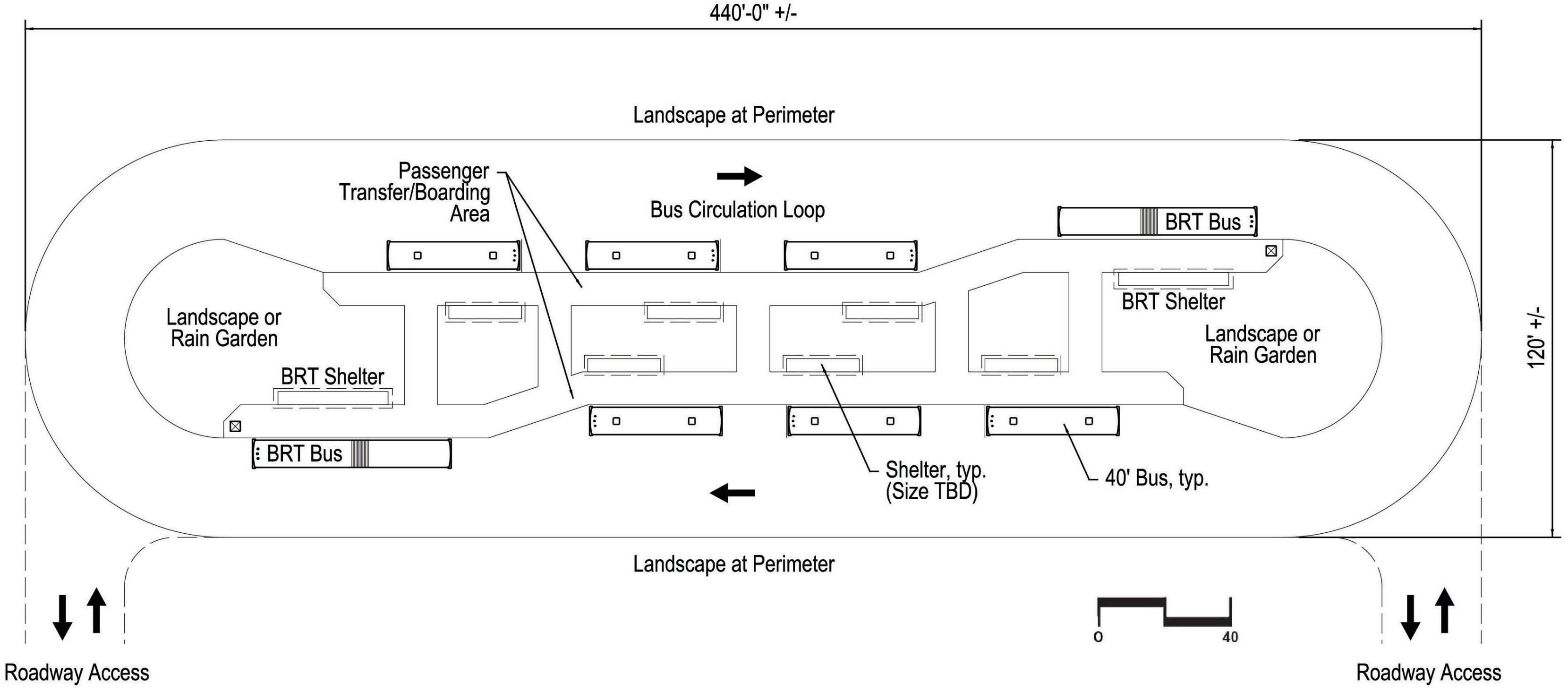
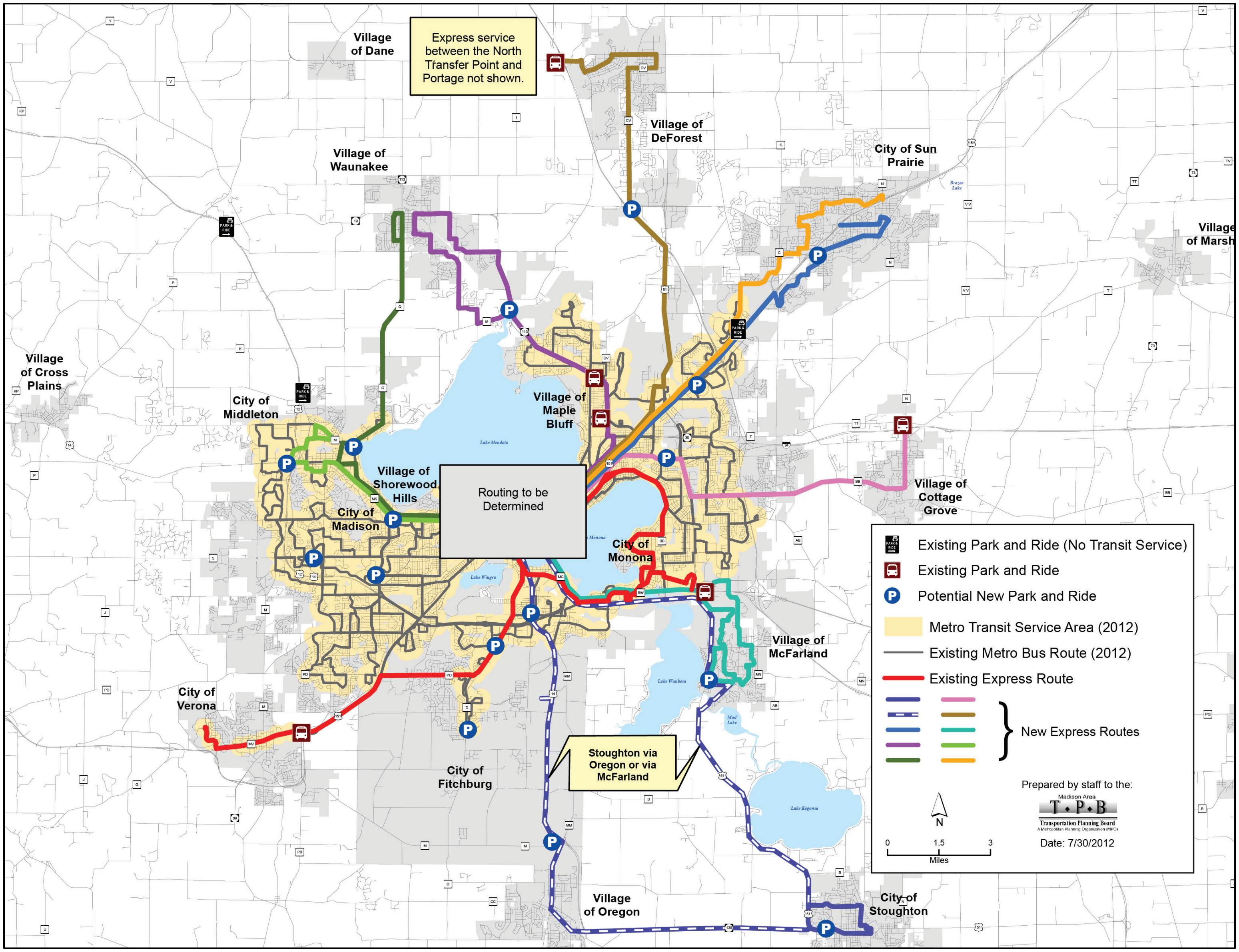


Figure 15: Potential Express Commuter Routes and Park and Ride Locations



Vehicles

BRT vehicles often have a unique look distinct from regular local and express service, and are typically designed to allow for faster boarding and alighting. Examples of BRT vehicles currently in service in the United States are shown in Figure 16 and Figure 17. When designing a BRT system, it is important for the vehicles to be unique for the two reasons. First, it helps create a strong brand recognition for the service and second, it allows customers to quickly and easily differentiate the between BRT and local bus service. The Transit Corridor Study assumed all BRT vehicles would have the amenities listed in Table 3.

Figure 16: BRT Vehicle, Seattle, Washington

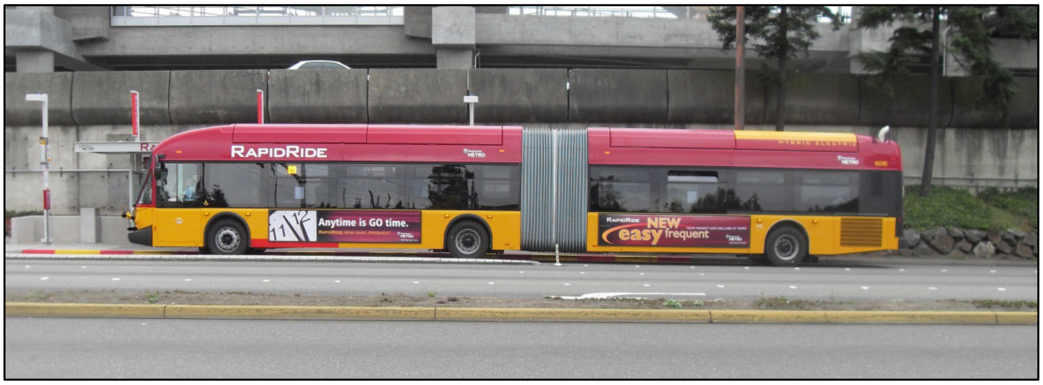


Figure 17: BRT Vehicle, Snohomish County, Washington

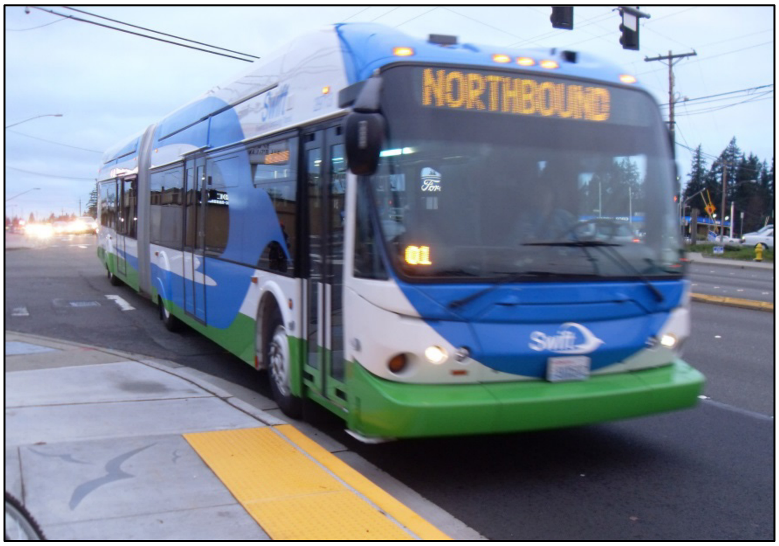


Table 3: BRT Vehicle Characteristics

Characteristic	Amenities Included
Bus length	Articulated bus (60')
Accessibility Characteristics	Low floor Ramp Passive wheelchair restraint
Doors	3 doors Left side doors for fixed-guideway alternatives Sliding doors
Propulsion	Hybrid – diesel
Bike Storage	On board bike storage
Precision Docking	Curb runners
Advanced Technology	Transit signal priority capability Wifi Automatic stop announcements Automated Passenger Counting (APC) system
Passenger accommodations	Alternative seating configurations Pull chords Onboard card readers Fare boxes

Route Structure

A key to maximizing the benefits while eliminating unnecessary costs associated with BRT service is to replace some local service along BRT corridors, to the extent possible, while improving connections to major destinations. This allows for cost savings from the existing service to be reinvested in BRT service.

Since the BRT system will become the principal transit service in each corridor, the Transit Corridor Study assumed that some of the local bus routes currently running along the corridors would be eliminated or operated at reduced frequencies. Generally, when an existing route was eliminated or service reduced, the planned BRT system was intended to provide adjacent areas with more frequent service over a longer period throughout the day. Figure 18 shows how the BRT system is positioned in coordination with the existing local routes[1].

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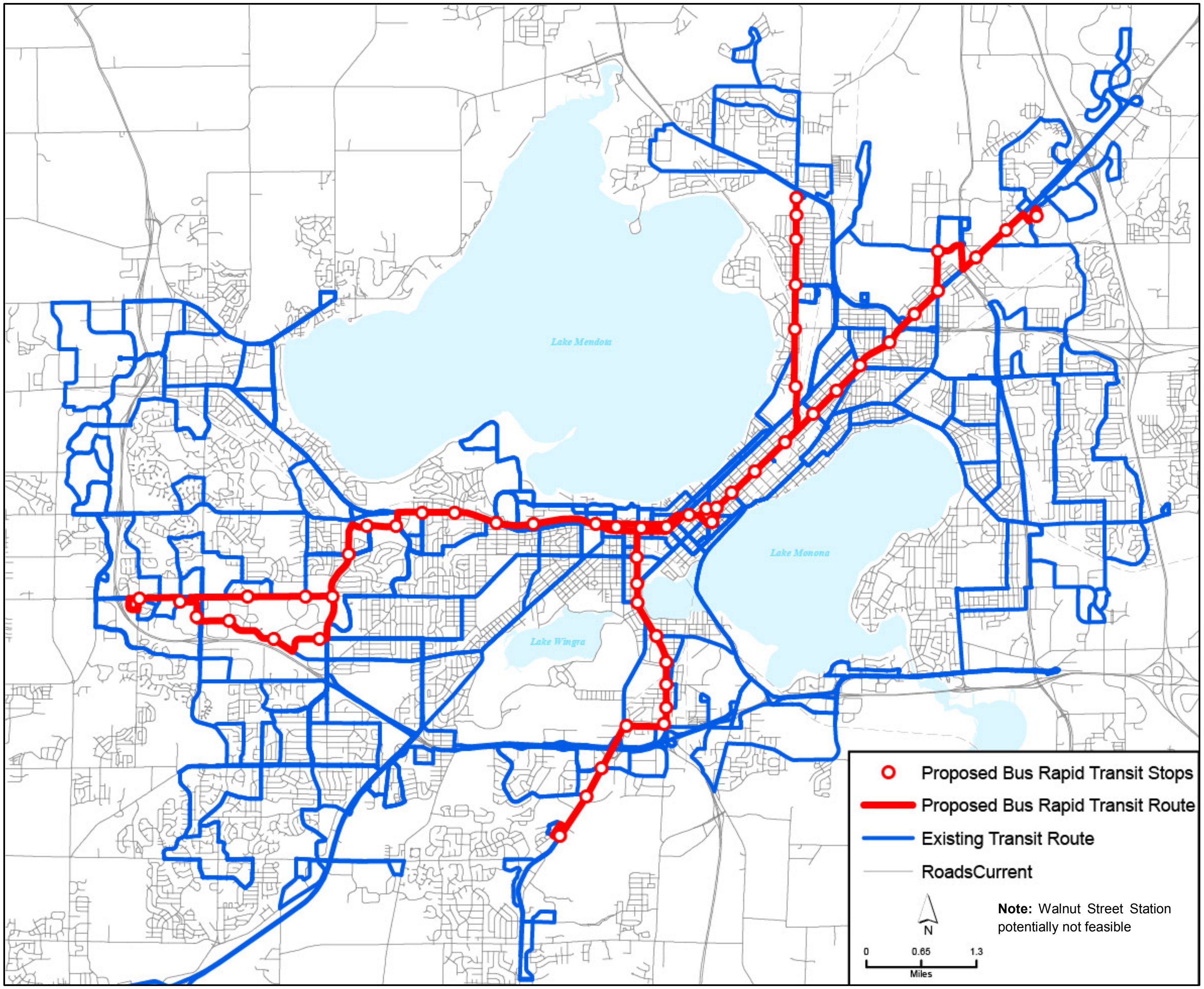
[1] For a fully labeled map of Metro Transit's existing service please see the maps available http://www.cityofmadison.com/metro/schedules/systemMaps.cfm

Figure 18: Proposed BRT Service and Existing Local Bus Service


Lake Mendota
Lake Monona
Lake Wingra
Proposed Bus Rapid Transit Stops
Proposed Bus Rapid Transit Route
Existing Transit Route
RoadsCurrent
N
0
0.65
1.3
Miles
Note: Walnut Street Station potentially not feasible

BRT Service Patterns

BRT service is proposed to be provided using essentially two routes that connect the four corridors. An east-west route would travel between High Point Road and East Towne Mall, and a north-south route would travel between Fitchburg and Warner Park. With the exception noted below, BRT buses are generally not mixed and interlined with local service.

At Warner Park, the north-south route splits – alternating buses travel west along Troy Drive and Northport Drive (Route 22), and east to Dane County Airport. This solution balances requests received from the public to provide fast, direct service to the airport with the need to achieve reasonable productivity performance with the high levels of service. It also prevents the north-south line from ending just before serving the medium density, transit dependent land uses along Northport Drive.

Many alternative service delivery concepts are practical and possible, including a west-north and south-east configuration and more thorough integration of commuter express and BRT integration for improved efficiency. However, these alternatives were not explored for the Transit Corridor Study and may be explored in future planning activities.

Modifications made to the local bus service within each corridor are presented in the corridor analysis later in this report and are detailed in Appendix I. A list of affected routes by corridor is shown in Table 4. Significant changes assumed include the deletion of Route 5 south of the Capitol Square, Route 6 east of the Capitol Square, and Route 67; and the rerouting of Route 70 from the Capitol Square to the West Transfer Point. Route 5 along Park Street is almost entirely duplicative of the south BRT corridor with the exception of the deviation along Fisher Street. This deviation serves an important neighborhood center; however, two BRT stations would be located two blocks to the west on Park Street. Route 6 along East Washington Avenue would be replaced with a low-frequency route serving local stops west of about Milwaukee Street. East of Milwaukee Street, some service coverage would be provided by Routes 4, 34, and 20. Route 20 would be rerouted to provide service coverage on Portage Road and Hayes Road. Route 67 primarily serves trips from the West Transfer Point to West Towne, which would be served by the east-west BRT line. Local coverage along Mineral Point Road would be provided by Route 14 and potentially a lower frequency peripheral route.

Table 4: Local Bus Service Modifications – Potentially Affected Routes

Corridor	Affected Routes
West	2, 14, 15, 37, 67, 70, 73
South	5, 13, 47, 44, 48
East	6, 25, 26, 34
North	20, 22, 27, 29

Fare Collection

Paying the fare on-board transit vehicles can be a time consuming activity slowing down the boarding process and extending dwell time at stations. Use of innovative fare collection methods coupled with off-board fare payment can significantly speed up the boarding process.

The Transit Corridor Study proposes that the BRT system would feature off-board fare collection and all door boarding. Passengers can pre-purchase a ticket using ticket vending machines (TVMs) at large and medium sized stations. Passengers with Smart Cards can pay using the smart card reader located at all stations or use an on-board Smart Card reader affixed inside each vehicle door. To accommodate passengers without Smart Cards that board at small stations, each BRT vehicle would also be equipped with a standard farebox, which may be located on the interior of the bus, rather than at the front, so that fare-paying passengers do not block the door. Fare checkers would be assigned to randomly check for proof of payment in order to enforce the fare system. Proof of payment fare systems are in wide use around the U.S. on BRT, light rail, and metro transit systems, and are generally considered to be highly beneficial. However, the needed fare checkers add significant operating cost to the system.

Transit Signal Priority (TSP)

TSP has the potential to reduce delay for buses at traffic signals while minimizing negative impacts on overall traffic operations. Reduced delay benefits transit customers by providing faster, more reliable travel times, and benefits transit operations by reducing operating costs. TSP can be designed flexibly to respond to traffic and transit needs. TSP is not signal preemption, the type of priority given to emergency vehicles. Signal preemption interrupts signal cycles and can cause greater disruption to traffic by causing traffic signal to break coordination, causing the loss of consecutive green lights on corridors. Instead, with TSP, priority is granted by making small changes to traffic signal timing in real time. This is expressed through an “early green” for a bus approaching an intersection, or an “extended green” for a bus about to be stopped at a signal. TSP for buses is in use in a number of urban areas around the U.S., including Portland, OR; Los Angeles, CA; New York, NY; and Minneapolis, MN.

How TSP Works

- A bus approaches an intersection with TSP technology
    - The bus will request priority if it is not ahead of schedule and other conditions are met.
    - Priority will not be granted if a call was recently granted, the signal controller is transitioning between timing plans, or if other conditions are met.
- TSP adjusts the signal timing to accommodate the bus:
    - If the signal is green, TSP technology extends the green light and shortens future phases to maintain coordination. This is called “Extended Green.”
    - If the signal is red, TSP technology shortens conflicting phases, if possible, so that a green light comes up sooner. This is called “Early Green.”
- The bus passes through the intersection.
- Signal timing returns to normal operation.

- Other methods of reducing traffic signal delay include phase skipping, phase insertion, and queue jumps. These strategies may be employed on a case-by-case basis, but were not examined for this study.

All signalized intersections along the corridors were evaluated for their potential to utilize TSP based on the “slack time” in their cycles (the amount of time beyond the minimum length of time needed to serve all the phases) in addition to other factors, such as the locations of bus stops, turning maneuvers, and congested intersections. 58 of the 99 signalized intersections along the BRT alignment were identified as potentially having the capability to incorporate TSP.

Traffic signals along the BRT corridors are almost entirely operated by the City of Madison, which exclusively uses Econolite controllers. The newest version of the Econolite traffic signal controller, the ASC/3, comes ready to integrate TSP with the purchase of a key that unlocks the software. Older controllers (ASC/2’s and ASC/8000’s) will likely need to be upgraded. Various communication strategies between the bus and traffic signal controller are available, including optical pulse, secure Wifi network, and wired wayside radio frequency readers and transponders.

If the City of Madison chooses to use TSP as an element of a future BRT system, city traffic engineers, the MPO and Metro Transit will all need to work together to design a TSP system that complements the city’s current signal system. Next steps include a more detailed analysis of the impacts to general purpose traffic and the estimate of benefits for transit in order to justify the installation and maintenance of TSP.

Branding

The Madison BRT system will have unique branding that will allow passengers to quickly differentiate BRT service from local bus service. The branding will be consistent across all system components include vehicles, stations, signage, etc.

Table 5: Summary of Madison BRT Component Assumptions

BRT Component	Assumption for Madison BRT Study
1. Service	• 10 minute peak period • 15 minute middle of the day, weekdays and Saturdays • 7 day per week service • 19 hours per weekday
2. Runningways	• Median busway where reasonable conditions exist • Side running in reserved lane for transit, right turns, and bicycles • Mixed traffic
3. Stations	• Far-side of intersections where possible • Unique shelter design with accompanying amenities • 9-inch platform height
4. Vehicles	• Articulated 60-foot bus; low floor, 3 doors • Hybrid diesel
5. Route Structure	• Two BRT routes: north-south and east-west • Replace duplicating service with BRT • Make new connections • Move transfer points as needed
6. Fare Collection	• Off-board ticket vending machines at major stations • Compatibility with existing fare card system
7. **Transit Signal Priority**	• Transit signal priority where possible • Customer information at stations
8. Branding	• Unique appearance at stations and on vehicles

Analysis Methods

Capital Costs

Capital costs include the one-time expenditures to build a system. Typically, capital costs include corridor improvements, stations, structures, signalization and communications systems, operations and maintenance facilities, vehicles, and right-of-way acquisition. Also included are "soft costs" for items such as engineering, construction services, insurance, and owner's costs, as well as contingencies for uncertainty in both the estimating process and the scope of the project. The Transit Corridor Study estimates capital costs in 2016 dollars to account for cost inflation over time as it will take some time to complete design activities leading up to construction if BRT is selected to move forward.

At this early study stage, there was not sufficient definition or detail to prepare detailed construction cost estimates for the various configurations under consideration. Rather, the capital cost estimates were developed using representative typical unit costs or allowances on a per-unit basis that are consistent with this level of review. Capital cost estimates developed for this study will need to undergo refinement based on additional design development work in future project phases.

Separate capital cost estimates were developed for each corridor and contain estimates for:

- Runningway improvements
- Stations
- Vehicles
- Right-of-way
- Professional services

Capital costs are broken out by corridor. Since several corridors overlap each other along University Avenue, Johnson Street, the Capitol Square, and East Washington Avenue, these costs are counted multiple times. In addition, there are system-wide costs that cannot be allocated directly to a single corridor. As a result, the total system-wide capital costs are different from the sum of the costs for each corridor. The assumptions for the study follow.

Runningway Treatment

Three different types of running-way treatments were evaluated for the Madison Transit Corridor Study. These treatments included constructing a median busway, side running dedicated lane and mixed-use lanes. The "Station and Running-way Types" graphics presented in the analysis section for each of the corridors (north, south, west, east and central) identify where these running-way treatments were used as the basis for preparing running-way treatment cost estimates. In some areas, costs to construct both a fixed guideway and corridor alternative were estimated to evaluate the difference in cost between the two alternatives.

Median busway treatments were considered on Mineral Point Road, University Avenue (Farley Avenue to Midvale Boulevard), South Park Street, and Fish Hatchery Road. The construction limits were identified roughly through aerial photographs and other sources. In general, a cross section was chosen to fit within the existing street right-of-way, with the exception of University Avenue, where a busway design would require substantial right-of-way acquisition and roadway reconstruction. See Appendix O for selected cross sections.

Runningway costs to construct the median busway included demolition, sub-grade preparation, pavement, curb and gutter, utility relocations, and reconstruction of the roadway/adjacent infrastructure to accommodate the median busway. In areas where a barrier is not provided between the adjacent roadway and busway, costs included painting the bus lane red.

Runningway costs to construct the side running dedicated lane included restriping of the existing roadway, costs to paint the bus lane red, and pavement costs for any roadway reconstruction that is required.

BRT Station Cost Estimates

BRT Stations were quantified as small, medium or large, based on the anticipated ridership for that particular station. Typical costs for each type of BRT station (small, medium, large) were developed for both unconstrained and constrained sites and include varying degrees of the following elements:

- BRT shelter structure
- Station lighting
- Platform area surface treatments
- Off-board fare collection
- Bike racks
- Seating
- Trash receptacles
- Real time signage
- Signage/branding
- Wayfinding/system maps/community maps
- Electric/communication equipment

The items listed below were included as variable costs that are dependent on the size and type of each BRT station:

- Demolition
- Utilities and drainage modifications
- Street improvements
- Urban design / landscape improvements
- Sidewalk / pedestrian improvements
- Traffic control
- Communication and electrical service

A range of lump sum unit prices were developed for these elements based on the small, medium and large station designs and the unit prices adjusted accordingly to take into account existing conditions that are unique to a particular station area. Included in all station cost estimates is the cost of building a raised platform at each BRT station. A typical Madison curb is 6" high, resulting in an 8-9" step to board a bus. For new BRT platforms, the study is recommending a 9" high platform, reducing the step to 5-6". This results in faster boarding and a more rail-like feel without the full expense of a 14" high curb needed for full level boarding.

Vehicles

Quantities for BRT buses were based on the operating service levels that are developed as part of the operating plan for the BRT corridors. The quantities for all buses were adjusted to reflect a spare ratio of 20 percent.

Right-of-way

Anticipated costs associated with the acquisition of right-of-way needed for construction and operation of the project was limited to the median busway alternatives and pinch point locations where station platforms did not fit within the existing right-of-way limits. Right-of-way quantities were classified by assumed land use characteristics or ownership.

Professional Services

Cost estimates for Professional Services include preliminary engineering; final design; project management for design and construction; construction administration and management; insurance; legal, permits review fees; surveys, testing, investigation, inspection; agency force account work. These costs were generated by applying assumed rates to different categories of the estimate. Table 6 identifies the professional services assumptions that were incorporated into the capital cost estimates.

Table 6: Professional Service Assumptions

Professional Service	Construction	Right of Way	Vehicles
Preliminary Engineering	2%	–	–
Final Design	2%	2%	1%
Project Management for Design and Construction	2%	2%	2%
Construction Administration and Management	5%	1%	–
Insurance	2%	–	–
Legal; Permits; Review Fees	1%	3%	–
Surveys, Testing, Investigation, Inspection	2%	6%	2%
Agency Force Account Work	4%	6%	1%
Total	**20%**	**20%**	**6%**

Allocated Contingencies

These contingencies are intended to compensate for unforeseen items of work, quantity fluctuations, and variances in unit costs that develop as the project progresses through the various stages of design development. The allocated contingency assumptions included in the capital cost estimates are as follows:

Corridor Improvements	20%
BRT Stations	20%
Vehicles	5%
Right of way	100%

Unallocated Contingencies

An unallocated contingency of 15% was also included in the capital cost estimates applied to the runningway and station construction, but not to vehicles or soft costs. This contingency generally is scaled back as projects proceed through more levels of design.

BRT Vehicle Storage and Maintenance

Implementing a BRT system would require Metro Transit to acquire additional storage space for the new larger BRT vehicles. Correctly estimating the cost of a new storage and maintenance facility at the feasibility study level is difficult, because the necessary inputs for such a facility vary greatly. The Transit Corridor Study includes a cost estimate for a maintenance facility in the overall system cost estimate; however the cost of the facility is not included in each of the individual corridor estimates as it is inappropriate to allocate such a full cost to any one corridor cost estimate. The study assumed an 85,000 square foot maintenance facility in order to accommodate administrative offices, bus operations, maintenance area, bus wash area, and come circulation within the facility.

Operating and Maintenance (O&M) Costs

O&M cost estimates incorporate costs that are anticipated for general bus operations and maintenance as well as additional costs related to BRT-specific service and facility features.

A cost model reflecting actual 2011 Metro Transit expenditures was developed to estimate operating costs for bus operations. Service variables driving the cost model include revenue bus-hours and revenue bus-miles. An additional fixed percentage amount was incorporated to reflect system administrative charges. Operating statistics (revenue bus-hours, revenue bus-miles, and peak buses) were determined for each proposed BRT route, and for proposed background bus service changes within each BRT corridor. The unit costs were applied to these statistics to determine O&M costs for each corridor configuration. Other variables in the O&M cost model specific to BRT operations include:

- BRT vehicle maintenance
- TVM maintenance
- BRT Station maintenance
- Police/fare enforcement

Vehicle Type. The proposed BRT corridors are assumed to operate articulated buses. Information from other studies indicates maintenance costs for articulated buses could be 25 percent higher than regular buses (e.g., more tires, larger interior to clean, etc. For articulated buses, an additional $0.35 per revenue bus-mile (25%) was used for articulated bus service.

Fare Collection O&M includes the maintenance of Ticket Vending Machines (TVMs) at BRT stations and the maintenance of fare media (smart card) validators on buses. For this project, $6,500 was used per TVM. TVMs were proposed only at higher ridership stops. On-board fare collection equipment (a farebox and smart card readers) were also assumed on the buses to provide a means for passengers to pay fares when boarding a stop without a TVM.

BRT Station Maintenance will require additional Metro Transit staff for periodic cleaning and maintenance of each station stop. A majority of the BRT stops in the corridors will be curb stops without extensive furnishings and with moderate passenger activity. Thus, a unit cost of $2,000 per directional stop was used as an annual O&M cost.

Additional **Police/Fare Enforcement** was also assumed to monitor the compliance of the off-board fare collection system. An average of $6.50 per revenue-hour was included.

Ridership Forecasts

The Transit Corridor Study uses the incremental pivoting method of forecasting to estimate ridership levels for 2016, the system's assumed opening year, and future ridership levels in the year 2035. The incremental pivoting method uses existing transit ridership as a baseline and then applies growth factors to the baseline numbers to account for transit service improvements and socio-demographic growth. Ridership estimates are provided for each BRT corridor and for the system as a whole. The Transit Corridor Study used the following sources of data to build the study forecasts:

Forecasting Model Inputs

- Metro Transit stop level ridership data from August 2011 calculated by the MPO: This dataset shows the ridership levels at each existing bus stop in the Metro Transit System.
- 2008 On-board Metro Transit Survey: This dataset reveals the trip origins and destinations for a sub-set of riders.
- MPO Regional Population and Employment Projection Model: The model maintained by the MPO that projects population, employment and travel patterns.

How the forecasts were estimated:

- The existing ridership at each station was identified using 2011 Metro Transit ridership data.
- To establish an existing baseline ridership level, all trips taken within 1/8 mile of a planned station location were aggregated and assigned to that station. The 1/8-mile distance was used, because many parallel lines of transit service will continue to draw riders when BRT is implemented. For example, it is assumed Route 28, a frequent service peak hour route that runs parallel to the planned BRT North Corridor, will continue to draw passengers along the East Johnson Street corridor.
- Areas along the planned BRT alignments were split along Traffic Analysis Zone lines into districts based current rider travel patterns found in the 2008 On-Board Metro Transit Survey. For example, a cluster of riders identified the Capitol Square area as the origin or destination of their trips; therefore a district was created in this area. Each of the proposed BRT stations was assigned to a district.

- Existing travel patterns between districts were applied to the 2011 Metro Ridership data to approximate the number of riders traveling between districts. For example, if 50 percent of the on-board survey participants reported they traveled from District 1 to District 2, it was assumed that 50 percent of 2011 ridership in those districts would also travel between Districts 1 and 2.
- The proportion of existing bus riders who would opt to use the BRT system instead of local bus service was estimated. Speed and frequency improvements attract a percentage of existing riders to the new system.
- The number of new riders the improved service is expected to generate is estimated. This estimate is calculated by applying several "attractiveness" factors to existing ridership levels. Attractiveness factors are based on the following characteristics of the service:
    - Span of service
    - Service frequency
    - Speed of service
    - Number of required transfers
    - Service reliability and comfort

  Attractiveness factors were taken from Transit Cooperative Research Project (TCRP) Report 95, Traveler Response to Transportation System Changes (http://www.trb.org/Publications/Blurbs/162432.aspx).
- The expected population and employment growth rates, taken from the MPO model, are applied to the estimates to forecast ridership levels in 2016 and 2035.

The ridership estimates are presented for each corridor in order to compare the corridors to each other, although the proposed service patterns contain interlined pairs of corridors. As a result, the west and south corridors are given credit for all boardings in the UW campus area west of the Capital Square.

Redevelopment Potential and Transit Oriented Development (TOD) Factor

Redevelopment Potential: The Transit Corridor study relied on the information reported in *Infill and Redevelopment Assessment*, a CARPC report, to assess the potential for redevelopment along each of the alignments. The *Infill and Redevelopment Assessment* identified sites along the corridors ready for redevelopment using several metrics addressing value, building size and others, combined with a visual inspection of the corridors. Based on conditions on the sites, they were classified by the estimated timeframe of their potential redevelopment, recognizing that certain sites will likely develop sooner than others. Next, each site was assigned a detailed building program (based on existing plans when available) or a building type suitable to the site's context. This process allowed the study to estimate the number of residential units and square feet of commercial development available to for infill and redevelopment along each alignment. The full *Infill and Redevelopment Assessment* is located in Appendix M.

TOD Factor: CARPC commissioned the Center for Neighborhood Technology (CNT) to analyze how TOD near BRT station locations would affect future year ridership projections. The result of this analysis is future year TOD ridership projections by corridor and for the entire BRT system.

Madison BRT Corridors

The Transit Corridor Study evaluated four corridors that radiate out from the Capitol Square, as shown in Figure 20. This portion of the report analyzes each of the corridors – West, South, North, and East – as separate corridors and presents a combined or system overview of key performance metrics. Common to all individual corridors is some portion of the Central Segment.

The Central Segment

The Central Segment is the portion of the system that runs through the Isthmus and the Capitol Square area between Park Street and Baldwin Street. This segment is unique, because the Transit Corridor Study assumes each corridor incorporates a portion of the Central Segment into its alignment. The Central Segment is a mix of side running and mixed traffic lanes, as shown in Figure 19. The West and South alignments share the portion of the Central Segment from the Capitol Square to N. Park Street. The North and East alignments share the portion from the Capitol Square to N. Baldwin Street.

Figure 19: Central Segment

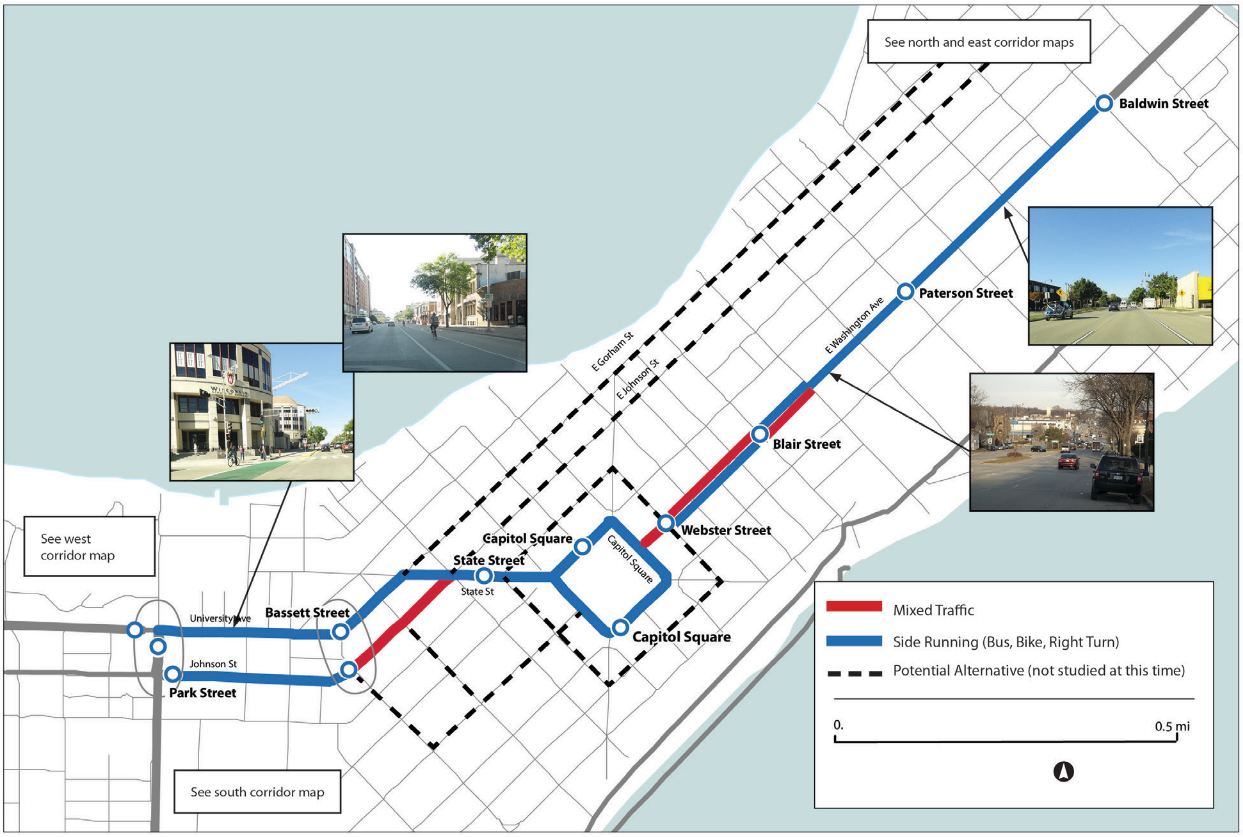
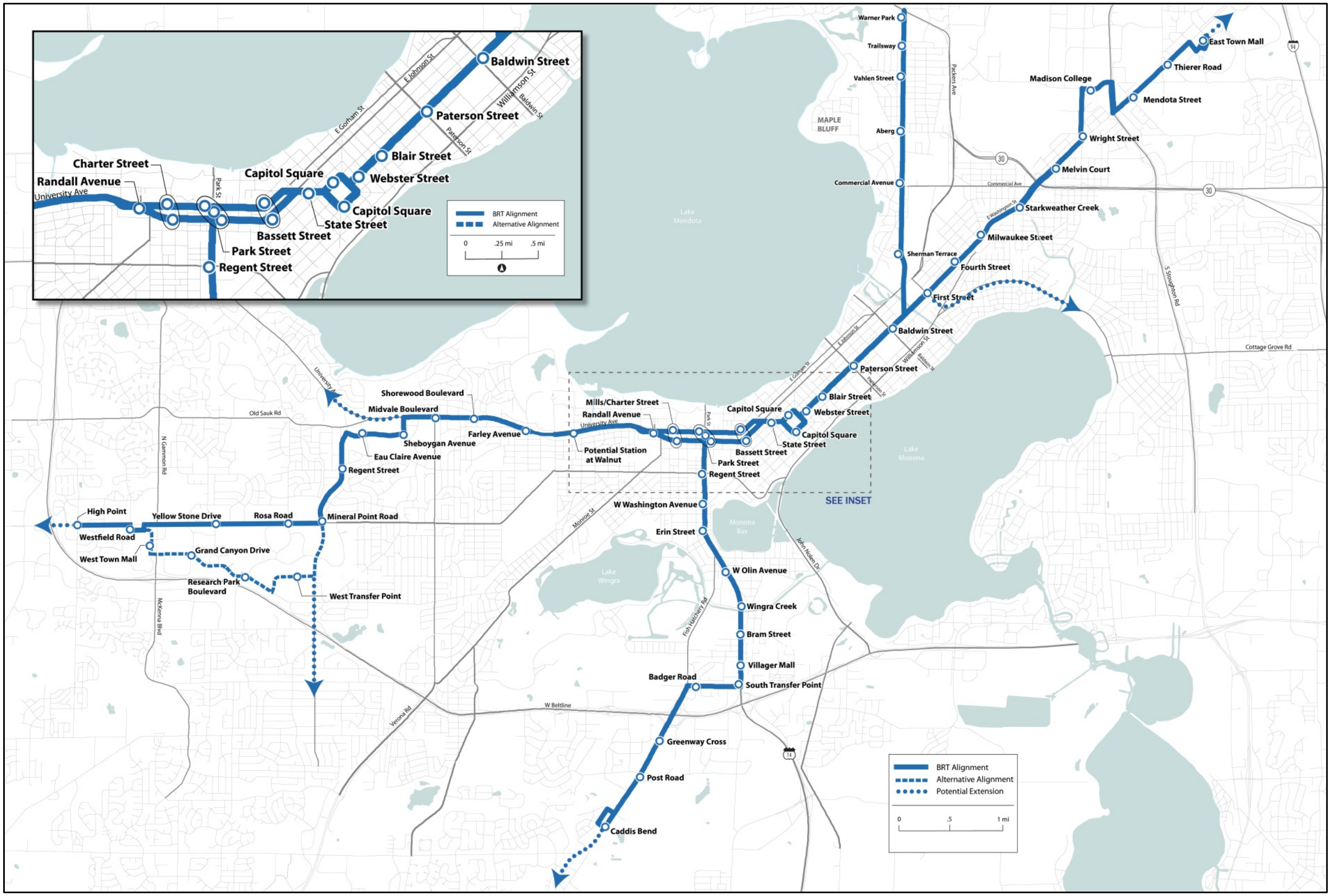


Figure 20: Madison BRT System – Proposed System



West Corridor – Mineral Point Road

Runningway

The West Corridor – Mineral Point Road alignment is 7.76 miles long. It begins at the Capitol Square, runs west along State Street to W. Gorham Street, and then through the University of Wisconsin-Madison's campus. It continues west along Campus Drive and University Avenue, turning south at N. Segoe Road to Sheboygan Avenue, and then continuing south along Whitney Way. Then the alignment turns west and runs along Mineral Point Road until S. High Point Road. For this alignment, the Transit Corridor Study assumes the West Transfer Point is relocated from its current site near Whitney Way and Tokay Boulevard to a new site near along Mineral Point Road in the vicinity of Whitney Way or Rosa Road.

The study analyzed a Corridor BRT and a Fixed Guideway BRT configuration in this corridor. The majority of the Corridor BRT Configuration is made up of side running lanes. Over half of the Fixed Guideway BRT configuration is a median running fixed guideway lane. The total length of each type of runningway for both configurations is shown in Table 7. The location of each runningway configuration is shown in Figure 21.

Major destinations along this route include:

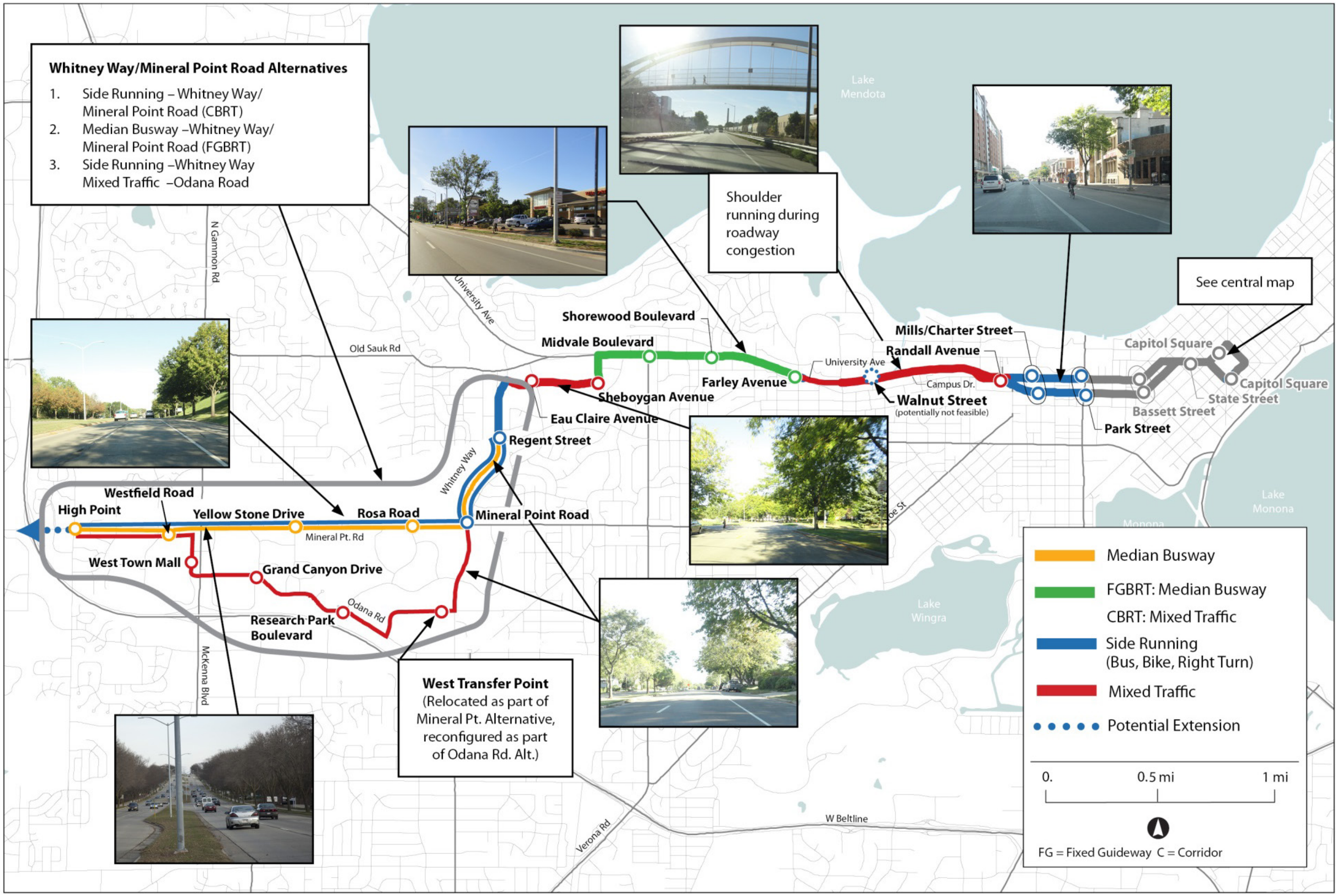
- Capitol Square
- University of Wisconsin – Madison
- UW Hospital and Clinics
- Hilldale Shopping Center
- Hill Farms State Office Building and residential area
- West Towne Mall

Table 7: West Corridor - Mineral Point Runningway Lengths

	Corridor BRT	Fixed Guideway BRT
One-Way Corridor Length (miles)	**7.76**	**7.76**
Fixed Guideway Length	-	4.30
Side Running Length (miles)	5.10	2.10
Mixed Traffic Length (miles)	2.66	1.36

Cross sections for the Mineral Point Road runningway configurations showing how side running and median fixed guideway lanes could fit into the current right-of-way in typical locations along the West Corridor are presented in Appendix O.

Figure 21: West Corridor Runningway Types and Station Locations



Stations

Both the Fixed Guideway and Corridor BRT configurations along the West Corridor – Mineral Point Road alignment have 17 stations per direction, resulting in stations spaced on average about 0.5 miles apart. The majority of the stations are almost evenly split between small and large stations. The large stations are generally found in the downtown and UW campus area, with the exception of the inbound Midvale Boulevard, Sheboygan Avenue and Eau Claire Avenue stations. All of the stations use a curbside platform and the majority are farside stations.

Table 8: West Corridor - Mineral Point Stations

Direction	Station Name	Shelter Size	Platform Type	Platform Location	Constrained/ Unconstrained Site
INBOUND	Capitol Square South	Existing*	Existing	Existing	Existing
	State Street	Existing	Existing	Existing	Existing
	Bassett Street	Medium	Curbside	Farside	Constrained
	Park Street (@ Johnson)	Large	Curbside	Farside	Unconstrained
	Mills Street	Large	Curbside	Nearside	Unconstrained
	Randall Avenue	Large	Curbside	Nearside	Unconstrained
	Farley Avenue	Large	Curbside	Nearside	Unconstrained
	Shorewood Boulevard	Medium	Curbside	Nearside	Constrained
	Midvale Boulevard	Large	Curbside	Farside	Constrained
	Sheboygan Avenue	Large	Curbside	Nearside	Unconstrained
	Eau Claire Avenue	Large	Curbside	Farside	Unconstrained
	Regent Street	Small	Curbside	Farside	Constrained
	Mineral Point Road	**TP – Large	TP	N/A	Unconstrained
	Rosa Road	Small	Curbside	Farside	Unconstrained
	Yellow Stone Drive	Small	Curbside	Farside	Unconstrained
	Westfield Road	Small	Curbside	Farside	Unconstrained
	High Point	Small	Curbside	Farside	Constrained
OUTBOUND	Capitol Square North	Existing	Existing	Existing	Existing
	State Street	Existing	Existing	Existing	Existing
	Bassett Street	Large	Curbside	Farside	Constrained
	Park Street (@ University)	Large	Curbside	Farside	Unconstrained
	Charter Street	Large	Curbside	Farside	UnConstrained
	Randall Avenue	Large	Curbside	Farside	Unconstrained
	Farley Avenue	Large	Curbside	Farside	Unconstrained
	Shorewood Boulevard	Small	Curbside	Farside	Unconstrained
	Midvale Boulevard	Medium	Curbside	Farside	Unconstrained
	Sheboygan Avenue	Small	Curbside	Farside	Unconstrained
	Eau Claire Avenue	Small	Curbside	Farside	Unconstrained
	Regent Street	Small	Curbside	Farside	Constrained
	Mineral Point Road	**TP – Large	TP	N/A	Unconstrained
	Rosa Road	Small	Curbside	Farside	Unconstrained
	Yellow Stone Drive	Small	Curbside	Farside	Constrained
	Westfield Road	Small	Curbside	Midblock	Unconstrained
	High Point	Small	Curbside	Farside	Unconstrained

Note: *Existing = Existing Shelters will be retained in this location and do not add to the cost estimate, **TP = Transfer Point

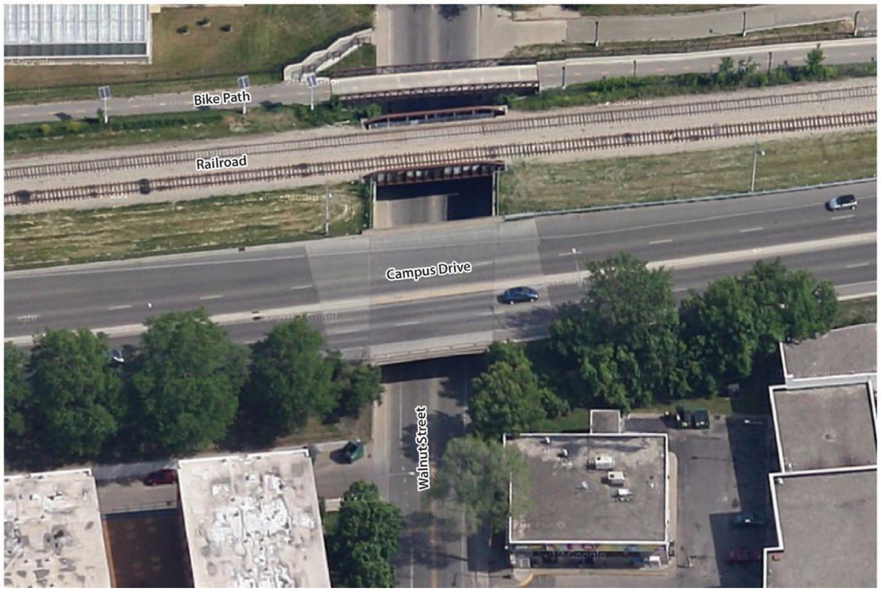
Walnut Street Station

The feasibility of placing a station where Walnut Street would intersect Campus Drive was reviewed as part of this study in order to provide access to the BRT system to and from the high density neighborhood near “Old” University Avenue to the south and parts of the west end of the UW campus to the north. The approximate location of the proposed station can be seen in Figure 21. Campus Drive is currently grade separated from Walnut St. and runs parallel to a railroad and bike path as shown in Figure 22. The study includes a station in this location but recognizes that it may be infeasible because of the following constraints:

- A substantial amount of civil engineering work would be necessary to allow pedestrian access to the station platform, including new or modified bridges and retaining walls.
- Considering the structural constraints of the location, the footprint necessary for a station would likely encroach into the railroad right-of-way and require the removal of the storage track south of the mainline track.
- Without elevators and/or escalators, the project would need several hundred feet of sidewalk ramp to connect the two different grades, making competing transit service on University Avenue or Route 80 more attractive than the BRT service.

For a more detailed description of the constraints associated with this site please see Appendix N.

Figure 22: Campus Drive and Walnut Street

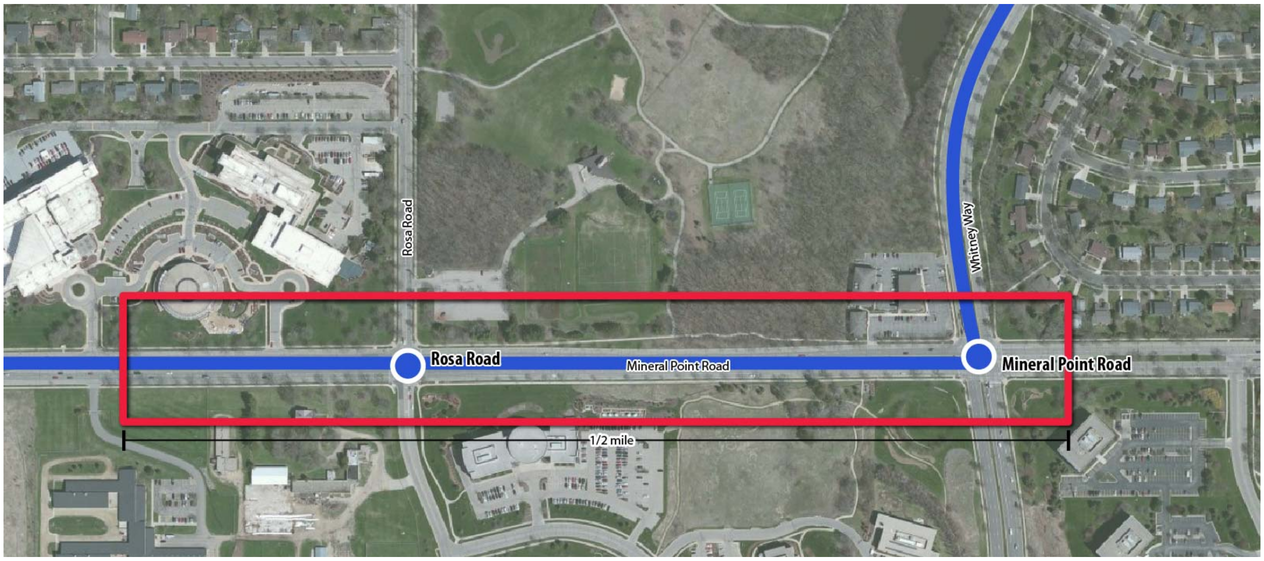


Source: Google Maps

Transfer Point

On the West Corridor Mineral Point Road alignment, the Transit Corridor Study assumes the West Transfer Point would be relocated along Mineral Point Road, as shown by the highlighted area in Figure 23. The Transit Corridor Study assumes the new transfer point needs a site with approximately 1.5 acres of land. It also assumes that all routes currently serving the West Transfer Point would be rerouted to the new location. As demonstrated by the aerial photography in Figure 23, the surrounding land uses in this area are predominantly low-density office and open space and do not currently support pedestrian-oriented retail activities.

Figure 23: West Transfer Point Potential Relocation Area



Travel Time Estimates

The Transit Corridor Study's travel time estimates for the West Corridor are shown in Table 9. To find the time passengers would save by using the proposed BRT system, the study compared the estimated BRT travel time in the corridor to the travel time of an existing Metro Transit route. The comparable existing peak-period transit route for the Mineral Point Road alignment is a combination of the Route 57 from the Capitol Square to the West Transfer Point, and the Route 67 to High Point Road. This trip currently has a scheduled travel time of 48 minutes. The proposed West Corridor – Mineral Point Road alignment offers a 23% percent travel time savings over the Route 57 to Route 67 option, in large part due to more direct routing and the elimination of the transfer.

Table 9: West Corridor – Mineral Point Road Travel Time Estimates

BRT One-way Travel Time (minutes)	**37**
Current One-way Peak Transit Travel Time (minutes)	48
Projected Travel Time Savings (minutes)	11
Percent of Travel Time saved using BRT	23%
Current Peak Drive Time (minutes)	23

Transit Signal Priority

The Transit Corridor Study travel time estimates assumed transit signal priority technology can be implemented at the 20 intersections shown in Table 10, but additional study is required before a final determination about transit signal priority is made.

Table 10: West Corridor – Mineral Point Road Intersections Recommended for Further Consideration of TSP

Street 1	Street 2
Mifflin Street	Wisconsin Avenue
Carroll	Main Street
Mifflin Street	Carroll Street/State Street
Carroll	W. Washington Avenue
Main Street	Pinckney Street/King Street
Main Street	Martin Luther King Blvd., Jr.
State Street	W. Dayton Street
State Street	Johnson Street
State Street	Gorham Street
University Avenue	Ridge Street
University Avenue	Segoe Road
Segoe Road	Frey Road
Whitney Way	Regent Street
Whitney Way	Mineral Point Road
Mineral Point Road	Yellowstone Dr.*
Mineral Point Road	Grand Canyon Dr.
Mineral Point Road	Gammon Road
Mineral Point Road	Westfield Rd.
Mineral Point Road	High Point Road
Mineral Point Road	Randolph Drive

Note: *Yellowstone Drive is anticipated to be a future signalized intersection

Major Changes to Local Bus Service

The Transit Corridor Study assumed major route changes to three existing Metro Transit routes as part of BRT implementation in the West Corridor. The affected routes and the proposed operational changes are shown in Table 11 and Table 12. In all cases changing or replacing these local routes with BRT service provides increased or similar frequencies in the corridor during peak hours, the midday and the evening.

Table 11: West Corridor Mineral Point – Affected Local Routes

Route	Existing Service	Peak Hours	Midday	Evening
2	Runs between West and North Transfer Points via the Capitol Square	15*	30	30
37	In the PM Peak hour three trips per day run on University Avenue from Highland Avenue to Eau Claire and Sheboygan Avenue	30	n/a	n/a
67	Runs from West Transfer Point to West Towne Mall	15	30	30

Note: *15 min frequencies in AM peak hour between West Transfer Point and Capitol Square. Other portions of this route have 30 min peak hour service during this time

Table 12: West Corridor Mineral Point – Proposed Operational Changes to Affected Local Routes

Route	Operational Change	Peak Hours	Midday	Evening
BRT	**All day service between High Point Road and Capitol Square**	**10**	**15**	**30**
2	Supplemental AM peak service between West Transfer Point and downtown replaced with BRT	30	30	30
37	Three PM peak hour trips to Eau Claire and Sheyboygan eliminated.		Replaced	
67	Service replaced with BRT		Replaced	

Redevelopment Potential

There are number of major sites within the West Corridor that have the capacity to add significant density, both residential and commercial. Implementation of BRT within this corridor could be the impetus for the development of some of these important sites.

Based on the analysis in the *Infill and Redevelopment Assessment*, completed by CARPC, the West Corridor - Mineral Point Road alignment has the potential to add approximately 1,500 residential units and 2.3 million square feet in commercial development. The location of the BRT stations will improve the potential for redevelopment for the following sites identified in the *Infill and Redevelopment Assessment*:

Station Location	Redevelopment Site
Farley Avenue	• Commercial area located at University and University Bay Drive • South side of University opposite Marshall Court
Midvale Boulevard	• Shopping area north of Hilldale
Sheboygan Avenue	• Hill Farms State Office Building
Eau Claire Avenue	• Red Cross Site
Rosa Road	• Northern end of CUNA Mutual parcel
West Towne Mall	• Various Parcels

West Corridor – Mineral Point Road Results

The total estimated capital costs for the Fixed Guideway Configuration is $61.17 million. Total estimated capital costs for the Corridor BRT configuration is $39.69 million. Total annual costs to operate the BRT service is $4.4 million, with the proposed local service changes saving $1.1 million, resulting in a total net annual operating and maintenance cost of $3.3 million for both configurations. Opening year daily ridership for the alignment is projected to be 8,780 riders and that estimate is expected to grow 10.1 percent by 2035. Assuming TOD influences, daily ridership is expected to grow by 10 percent by 2035. No differences in ridership are anticipated between the Fixed Guideway BRT and Corridor BRT configurations as the service plan assumptions and station locations are the same for both options.

Table 13: West Corridor - Mineral Point Road - Capital Costs

Alignment Configuration	Mineral Point Road - Fixed Guideway	Mineral Point Road – Corridor BRT
Side Running Lane Improvements	$0.9 M	$2.18 M
Median Running Lane Improvements	$21.37 M	$0
TSP	$0.76 M	$0.76 M
ROW Acquisition	$2.23 M	$1.11 M
Station Costs	$8.23 M	$9.56 M
Fleet Costs (includes 20% spare factor)	$15.6 M	$13.0 M
Transfer Point Reconstruction Costs	$2.16 M	$2.16 M
Soft Costs	$10.75 M	$5.09 M
Unallocated Contingency Costs	$6.96 M	$3.13 M
Total Construction Costs (2016 $)	**$68.96 M**	**$36.99 M**

Table 14: West Corridor Mineral Point - Annual Operating and Maintenance Costs (2012$)

BRT Operating Costs	$2.7 M
BRT Maintenance Costs	$1.7 M
Reductions to Local Service	-$1.1 M
Total O&M Costs	**$3.3 M**

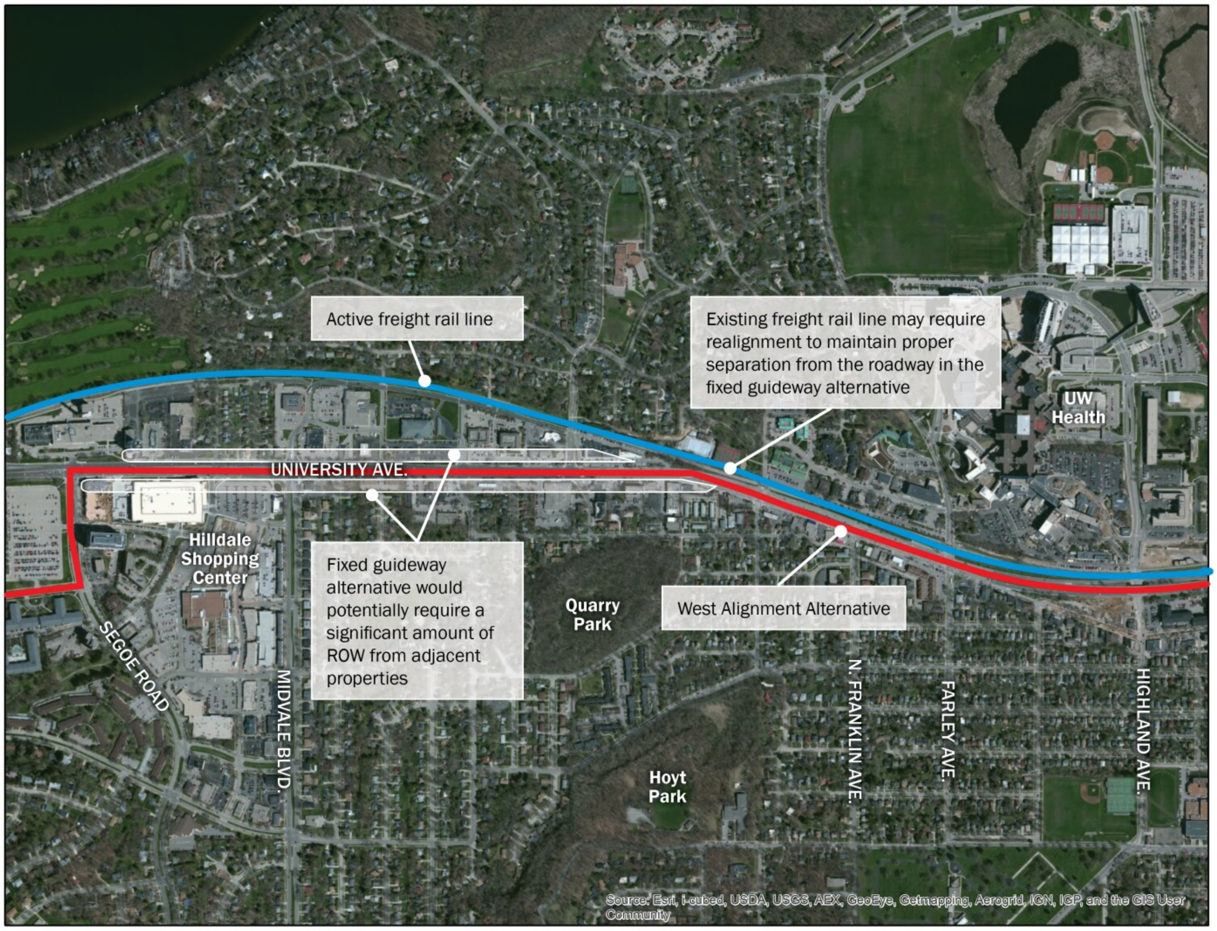
Table 15: West Corridor Mineral Point - Daily Ridership

Opening Year (2016)	8,780
Future Ridership (2035)	9,670
TOD Enhanced Ridership (2035)	10,650

University Avenue Fixed Guideway Impacts

Construction of a fixed guideway on University Avenue, which would include expansions of the existing roadway to accommodate additional travel lanes for BRT buses and bike lanes, would have a significant impact to the adjacent businesses and existing freight rail line. The fixed guideway alternative, with a median busway in this area, would require additional ROW to be purchased from adjacent businesses north and south of University Avenue to accommodate the proposed typical section. East of Shorewood Boulevard, the problem is particularly severe because an active rail line is immediately north of University Avenue and buildings with little setback are south of University Avenue. Additionally, University Avenue was reconstructed within the last few years. Figure 24 illustrates these constraints. Due to the significance of these impacts, it is recommended that a fixed guideway alternative on University Avenue not move forward for further evaluation at this time.

Figure 24: University Avenue Fixed Guideway Impacts



Active freight rail line

Existing freight rail line may require realignment to maintain proper separation from the roadway in the fixed guideway alternative

Fixed guideway alternative would potentially require a significant amount of ROW from adjacent properties

West Alignment Alternative

Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community

West Corridor – Odana Road

Runningway

The West Corridor – Odana Road alignment begins at the Capitol Square, runs west along the same alignment as the West Corridor – Mineral Point Road alignment. Approaching Mineral Point Road, the alignment continues to the existing West Transfer Point and travels west along Odana Rd, then entering the West Towne ring road serving West Towne Mall. Finally the alignment turns west onto Mineral Point Road at Westfield Road and continues to High Point Road. Only a Corridor BRT configuration was analyzed for this alignment. The Transit Corridor study assumes this configuration connects with the West Transfer Point in its current location. The majority of the Odana Road alignment runs in mixed traffic. The total length of each runningway type is shown in Table 16 and the location of each type of runningway configuration is shown in Figure 21.

Major destinations along this route include:

- Capitol Square
- University of Wisconsin – Madison
- UW Hospital and Clinics
- Hilldale Shopping Center
- Hill Farms State Office Building and residential areas
- University Research Park
- West Towne Mall

Table 16: West Corridor Odana Road - Runningway Lengths

One-Way Corridor Length (miles)	**8.61**
Side Running Length (miles)	2.70
Mixed Traffic Length (miles)	5.91

Cross sections in Appendix O show how side running lanes could fit into the current right-of-way in a typical location along the West Corridor – Odana Road alignment.

Stations

The West Corridor – Odana Road alignment contains 19 stations per direction spaced, on average, 0.5 miles apart. The characteristics of each station are shown in Table 17. Approximately half of the stations are evenly split between small and large stations. The large stations are generally found in the downtown and UW campus area, with the exception of the inbound Midvale Boulevard, Sheboygan Avenue and Eau Claire Avenue stations. All of the stations use a curbside platform and the majority are farside stations. There are 24 unconstrained stations in this alignment, adding to the estimated amount of purchased right-of-way necessary for this alignment.

Table 17: West Corridor - Odana Road Station Characteristics

	Station Name	Shelter Size	Platform Type	Platform Location	Constrained/ Unconstrained Site
INBOUND	Capitol Square South	Existing	Existing	Existing	Existing
	State Street	Existing	Existing	Existing	Existing
	Bassett Street	Medium	Curbside	Farside	Constrained
	Park Street (@ Johnson)	Large	Curbside	Farside	Unconstrained
	Mills/Charter Street	Large	Curbside	Nearside	Constrained
	Randall Avenue	Large	Curbside	Nearside	Unconstrained
	Farley Avenue	Large	Curbside	Nearside	Unconstrained
	Shorewood Boulevard	Medium	Curbside	Nearside	Constrained
	Midvale Boulevard	Large	Curbside	Farside	Constrained
	Sheboygan Avenue	Large	Curbside	Nearside	Constrained
	Eau Claire Avenue	Large	Curbside	Farside	Unconstrained
	Regent Street	Small	Curbside	Farside	Unconstrained
	Mineral Point Road	Small	Curbside	Farside	Unconstrained
	West Transfer Point	TP** - Large	TP	N/A	Unconstrained
	Research Park Boulevard	Small	Curbside	Nearside	Unconstrained
	Grand Canyon Drive	Small	Curbside	Farside	Unconstrained
	West Towne Mall	Large	Curbside	Midblock	Unconstrained
	Westfield Road	Small	Curbside	Farside	Unconstrained
	High Point	Small	Curbside	Farside	Constrained
OUTBOUND	Capitol Square South	Existing	Existing	Existing	Existing
	State Street	Existing	Existing	Existing	Existing
	Bassett Street	Large	Curbside	Farside	Constrained
	Park Street (@ University)	Large	Curbside	Farside	Unconstrained
	Mills/Charter Street	Large	Curbside	Farside	Constrained
	Randall Avenue	Large	Curbside	Farside	Unconstrained
	Farley Avenue	Large	Curbside	Farside	Unconstrained
	Shorewood Boulevard	Small	Curbside	Farside	Unconstrained
	Midvale Boulevard	Medium	Curbside	Farside	Unconstrained
	Sheboygan Avenue	Small	Curbside	Farside	Unconstrained
	Eau Claire Avenue	Small	Curbside	Farside	Unconstrained
	Regent Street	Small	Curbside	Farside	Unconstrained
	Mineral Point Road	Small	Curbside	Farside	Unconstrained
	West Transfer Point	TP** - Large	TP	N/A	Unconstrained
	Research Park Boulevard	Small	Curbside	Far	Unconstrained
	Grand Canyon Drive	Small	Curbside	Farside	Unconstrained
	West Towne Mall	Small	Curb	Midblock	-
	Westfield Road	Small	Curbside	Farside	Unconstrained
	High Point	Small	Curbside	Farside	Unconstrained

Note: *Existing = Existing Shelters will be retained in this location and do not add to the cost estimate, **TP = Transfer Point

Transfer Point

The Transit Corridor Study assumed that for the West Corridor – Odana Road alignment the West Transfer Point would be expanded in its existing location.

Travel Time Estimates

The Transit Corridor Study's travel time estimates for the West Corridor – Odana Road alignment are shown in Table 18. The comparable existing transit route to the West Corridor – Odana Road alignment is a combination of the Route 57 from the Capitol Square to the West Transfer Point, and the Route 67 to High Point Road. This trip currently has a scheduled travel time of 48 minutes. The proposed West Corridor – Mineral Point Road alignment offers a 17% percent travel time savings over the Route 2 to Route 67 option.

Table 18: West Corridor – Odana Road Travel Time Estimates

BRT One-way Travel Time (minutes)	**40**
Current One-way Peak Transit Travel Time (minutes)	48
Projected Travel Time Savings (minutes)	8
Percent of Travel Time saved using BRT	17%
Current Peak Drive Time (minutes)	29

Transit Signal Priority (TSP)

The Transit Corridor Study assumed TSP technology can be implemented at the 21 intersections shown in Table 19.

Table 19: West Corridor - Odana Road Intersections Recommended for Further Consideration of TSP

Street 1	Street 2
Mifflin Street	Wisconsin Avenue
Carroll Street	Main Street
Mifflin Street	Carroll Street/State Street
Carroll Street	W. Washington Avenue
Main Street	Pinckney Street/King Street
Main Street	Martin Luther King Blvd., Jr.
State Street	W. Dayton Street
State Street	Johnson Street
State Street	Gorham Street
University Avenue	Ridge Street
University Avenue	Segoe Road
Segoe Road	Frey Road
Whitney Way	Science Drive
Whitney Way	Tokay Blvd.
Odana Road	Research Park Blvd.
Odana Road	Potomac Lane
Tokay Blvd.	Odana Road
Odana Road	Grand Canyon Drive
Odana Road	Gammon Road
Westfield Road	Mineral Point Road
Mineral Point Road	High Point Road

Major Changes to Local Bus Service

Local bus service changes in the West Corridor are the same for both the Mineral Point Road and Odana Road alignments. Please see Table 11 and Table 12 in the Mineral Point Road section for a description of the affected routes and proposed operational changes.

Redevelopment Potential

Based on the analysis in the *Infill and Redevelopment Assessment*, the West Corridor – Odana Road alignment has the potential to add approximately 2,600 residential units and 2.9 million square feet in commercial development. The location of the BRT stations will improve the potential for redevelopment for the following sites identified in the *Infill and Redevelopment Assessment*:

Station Location	Redevelopment Site
Farley Avenue	• Commercial area located at University and University Bay Drive • South side of University opposite Marshall Court
Midvale Boulevard	• Shopping area north of Hilldale
Sheboygan Avenue	• DOT Hill Farms
Eau Claire Avenue	• Red Cross Site
West Transfer Point	• Westgate Mall • Low density commercial development on the southwest corner of Odana Road and Whitney Way
Grand Canyon Drive	• Market Square and properties adjacent to the west • Burlington Coat Factory/Joanne Fabrics retail center
West Towne Mall	• West Towne Mall

West Corridor – Odana Road Results

The total estimated capital cost for building Corridor BRT in the Odana Road alignment is $37.43 million, as shown in Table 20. Total annual costs to operate the BRT service is $4.5 million, with the proposed local service changes saving $1.1 million, resulting in a total net annual operating and maintenance cost of $3.4 million. Opening year daily ridership for the alignment is projected to be 8,930 riders and that estimate is expected to grow 9.6 percent by 2035. Assuming TOD influences, daily ridership is expected to grow by 10 percent by 2035. These ridership numbers are slightly higher than ridership numbers for the Mineral Point Road alignment.

Table 20: West Corridor - Odana Road Capital Costs

Alignment Configuration	Odana – Corridor BRT
Side Running Lane Improvements	$1.15 M
Median Running Lane Improvements	$0
TSP	$0.79 M
ROW Acquisition	$0.1 M
Station Costs	$12.13 M
Fleet Costs (includes 20% spare factor)	$13.0 M
Transfer Point Reconstruction Costs	$2.16 M
Soft Costs	$5.38 M
Unallocated Contingency Costs	$3.26 M
Total Construction Costs (2016 $)	**$37.97 M**

Table 21: West Corridor - Odana Road Operating and Maintenance Costs

	Corridor BRT
BRT Operating Costs	$2.7 M
BRT Maintenance Costs	$1.8 M
Reductions to Local Service	-$1.1 M
Total O&M Costs	**$3.4 M**

Table 22: West Corridor - Odana Road Ridership

Opening Year (2016)	8,930
Future Ridership (2035)	9,790
TOD Enhanced Ridership (2035)	10,760

South Corridor

Runningway

The South Corridor is 5.5 miles long. The alignment begins at the Capitol Square and runs west along State Street, W. Gorham Street and touches the eastern side of the University of Wisconsin – Madison's campus. It travels south on N. Park Street until turning west on Badger Road and running through the South Transfer Point. The route follows Fish Hatchery Road south until Caddis Bend in Fitchburg.

The Transit Corridor Study analyzed both a Fixed Guideway BRT and a Corridor BRT configuration for this alignment. In the Fixed Guideway Configuration over 60 percent of the corridor operates in a median fixed guideway runningway. In the Corridor BRT configuration over 75 percent of the corridor operates in side running lanes. The total length of each runningway type is shown in Table 23. The location of each type of runningway configuration is shown in Figure 25.

Major destinations along this route include:

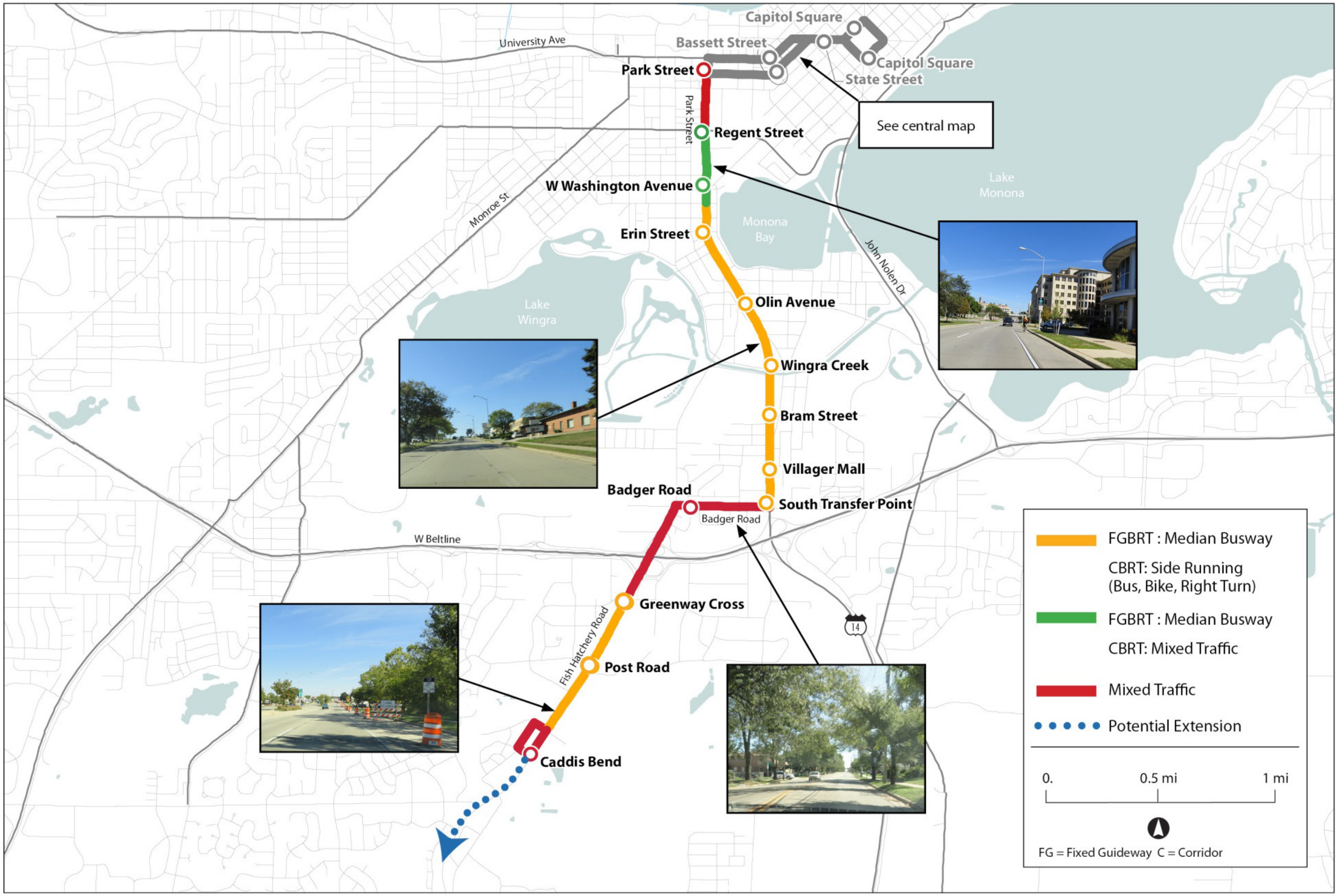
- Capitol Square
- University of Wisconsin – Madison
- Meriter and St Mary's Hospitals
- Villager Shopping Center
- Fitchburg

Table 23: South Corridor Runningway Lengths

	Corridor BRT	Fixed Guideway BRT
One-Way Corridor Length (miles)	**5.50**	**5.50**
Fixed Guideway Length	-	3.40
Side Running Length (miles)	4.20	1.10
Mixed Traffic Length (miles)	1.30	1.00

Cross sections in Appendix O show how median running fixed guideways and side running lanes could fit into the current right-of-way in a typical location along the South Corridor.

Figure 25: South Corridor Runningways and Station Locations



South Corridor Stations

The South Corridor contains 15 stations per direction spaced on average 0.4 miles apart. Characteristics for each station are shown in Table 24. The large majority of the stations are small stations. All stations use a curbside platform configuration. Almost half of the stations are farside stations. There are 19 unconstrained stations, adding to the estimated amount of purchased right-of-way necessary for this alignment. Bram Street is the only midblock station.

Table 24: South Corridor Station Characteristics

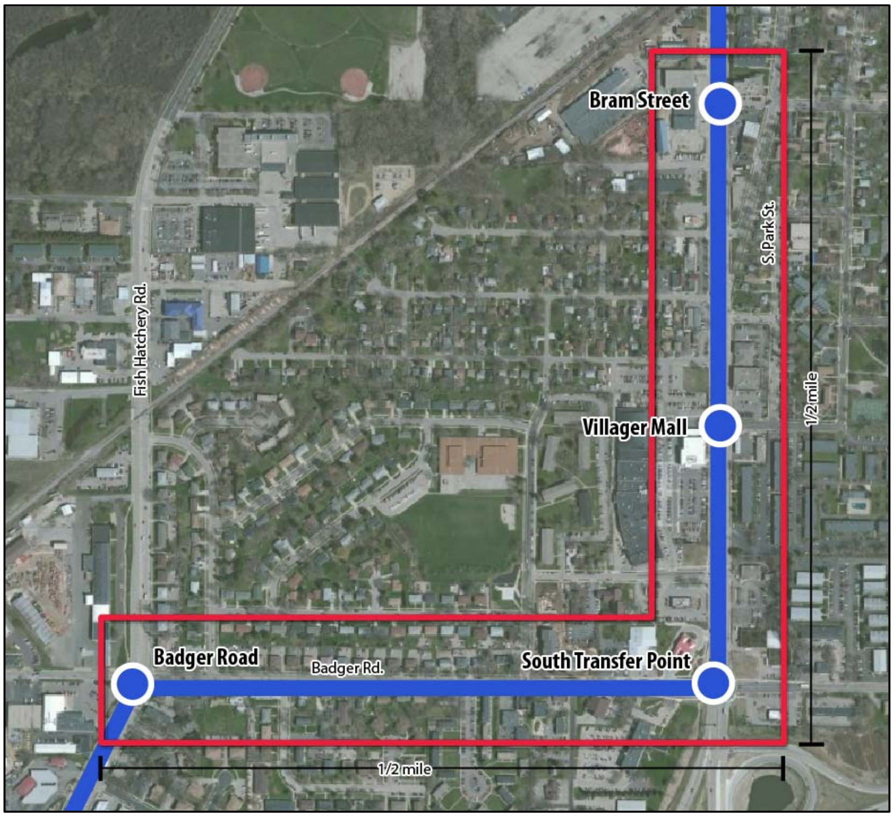
Direction	Station Name	Shelter Size	Platform Type	Platform Location	Constrained/ Unconstrained Site
INBOUND	Capitol Square South	Existing*	Existing	Existing	Existing
	State Street	Existing	Existing	Existing	Existing
	Bassett Street	Medium	Curbside	Farside	Constrained
	Park Street (@ Johnson)	Large	Curbside	Farside	Unconstrained
	Regent Street	Large	Curbside	Farside	Constrained
	W. Washington Avenue	Small	Curbside	Farside	Unconstrained
	Erin Street	Small	Curbside	Farside	Constrained
	Olin Avenue	Small	Curbside	Farside	Constrained
	Wingra Creek	Small	Curbside	Farside	Unconstrained
	Bram Street	Small	Curbside	Midblock	Constrained
	Villager Mall	Small	Curbside	Farside	Unconstrained
	South Transfer Point				
	Badger Road	Small	Curbside	Farside	Unconstrained
	Greenway Cross	Small	Curbside	Nearside	Unconstrained
	Post Road	Small	Curbside	Farside	Unconstrained
	Caddis Bend	Small	Curbside	Farside	Unconstrained
OUTBOUND	Capitol Square North	Existing	Existing	Existing	Existing
	State Street	Existing	Existing	Existing	Existing
	Bassett Street	Large	Curbside	Farside	Constrained
	Park Street (between Uni. & Johnson)	Large	Curbside	Farside	Unconstrained
	Regent Street	Small	Curbside	Farside	Unconstrained
	W. Washington Avenue	Small	Curbside	Farside	Unconstrained
	Erin Street	Small	Curbside	Farside	Constrained
	Olin Avenue	Small	Curbside	Farside	Constrained
	Wingra Creek	Small	Curbside	Nearside	Unconstrained
	Bram Street	Small	Curbside	Midblock	Unconstrained
	Villager Mall	Small	Curbside	Farside	Unconstrained
	South Transfer Point	TP** - Large	TP	N/A	Unconstrained
	Badger Road	Small	Curbside	Nearside	Unconstrained
	Greenway Cross	Small	Curbside	Farside	Unconstrained
	Post Road	Small	Curbside	Far	Unconstrained
	Caddis Bend	Small	Curbside	Nearside	Unconstrained

Note: *Existing = Existing Shelters will be retained in this location and do not add to the cost estimate, **TP = Transfer Point

Transfer Point

The Transit Corridor Study assumed the South Transfer Point would be expanded in its existing location or relocated close by, as shown in Figure 26. The Transit Corridor Study assumes a new transfer point would need a site approximately 1.5 acres in size.

Figure 26: Potential Relocation Area for the South Transfer Point



Travel Time Estimates

The Transit Corridor Study's travel time estimates for the South Corridor are shown Table 25. The best comparable existing peak-period transit route in the South Corridor is Route 47. Currently, traveling on Route 47 from the Capitol Square to Caddis Bend takes 38 minutes. The proposed South Corridor alignment offers a 21 percent travel time savings over the Route 47.

Table 25: South Corridor Travel Time Estimates

BRT One-way Travel Time (minutes)	30
Current One-way Peak Transit Travel Time (minutes)	38
Projected Travel Time Savings (minutes)	8
Percent of Travel Time saved using BRT	21%
Current Peak Drive Time (minutes)	16

Transit Signal Priority (TSP)

The Transit Corridor Study assumed TSP technology can be implemented at the 17 intersections shown in Table 26.

Table 26: South Corridor - Intersections Recommended for Further Consideration of TSP

Street 1	Street 2
Mifflin Street	Wisconsin Avenue
Carroll Street	Main Street
Mifflin Street	Carroll Street/State Street
Carroll Street	W. Washington Avenue
Main Street	Pinckney Street/King Street
Main Street	Martin Luther King Blvd., Jr.
State Street	W. Dayton Street
State Street	Johnson Street
State Street	Gorham Street
Park Street	W. Washington Avenue
Park Street	Regent Street
Park Street	Hughes Place
Park Street	Badger Road
Fish Hatchery Road	Ann Street/Emil Street
W. Badger Road	Fish Hatchery Road
Fish Hatchery Road	Post Road
Caddis Bend	Fish Hatchery Road

Major Changes to Local Bus Service

The Transit Corridor Study assumed major route changes to three existing Metro Transit routes as part of BRT implementation in the South Corridor. The affected routes and the proposed operational changes are shown in Table 27 and Table 28. In all cases replacing or changing these local routes with BRT service provides increased or similar frequencies in the corridor during peak hours, the midday and the evening.

Table 27: South Corridor – Affected Local Routes

Route	Existing Service	Peak Hours	Midday	Evening
5	All day service between the South and East Transfer Points via the Capitol Square	30	30	60
44/48	Run between Fitchburg (south of Caddis Bend) and the UW campus	30	n/a	n/a

Table 28: South Corridor - Proposed Operational Changes to Affected Local Routes

Route	Operational Change	Peak Hours	Midday	Evening
BRT	**All day service between High Point Road and Capitol Square**	**10**	**15**	**30**
5	Service between the Capitol Square and the South Transfer Point replaced with BRT	Replaced		
44/48	Replace service north of Caddis Bend with BRT. Routing south of Caddis Bend remains the same	30	n/a	n/a

Redevelopment Potential

Park Street has been ripe for redevelopment for many years and there are numerous plans that outline the development potential. Development activity in the corridor has picked up in recently. Multiple developments are either complete, under construction, or have received the necessary approvals to begin construction. In fact, one mixed use development was recently completed in the area with no parking for residents. BRT would likely significantly enhance the redevelopment potential of this corridor.

Based on the analysis in the *Infill and Redevelopment Assessment*, the South Corridor has the potential to add approximately 1,120 housing units and 1.3 million square feet in commercial development. The location of the BRT stations will improve the potential for redevelopment for the following sites identified in the *Infill and Redevelopment Assessment:*

Station Location	Redevelopment Site
West Washington Avenue	• Meriter Hospital's potential medical office building located on the Triangle
Erin Street	• Underutilized sites north of Erin Street on the east side of Park Street
Olin Avenue	• Wingra Triangle
Wingra Creek	• Wingra Triangle • Former Thorstad site
Villager Mall	• Villager Mall
South Transfer Point	• Comstock Tires and adjacent properties on the corner of Park Street and Badger Road
Post Road	• Multiple sites on either side of Fish Hatchery Avenue to the north and south

South Corridor Results

The South Corridor total estimated capital cost for building Fixed Guideway BRT is $54.89 million and the total estimated capital cost for building Corridor BRT is $29.92 million, as shown in Table 29. Total annual costs to operate the BRT service is $3.6 million, with the proposed local service changes saving $0.9 million, resulting in a total net annual operating and maintenance cost of $2.7 million for both configurations. Opening year daily ridership for the alignment is projected to be 6,150 riders and that estimate is expected to grow 13.8 percent by 2035. Assuming TOD influences, daily ridership is expected to grow by 13 percent by 2035. No differences in ridership are anticipated between the Fixed Guideway BRT and Corridor BRT configurations as the service plan assumptions and station locations are the same for both options.

Table 29: South Corridor Capital Costs

Alignment Configuration	Fixed Guideway	Corridor
Side Running Lane Improvements	$0.48 M	$1.79 M
Median Running Lane Improvements	$18.59 M	$0
TSP	$0.7 M	$0.7 M
ROW Acquisition	$1.1 M	$1.1 M
Station Costs	$5.23 M	$7.14 M
Fleet Costs (includes 20% spare factor)	$12.76 M	$10.64 M
Transfer Point Reconstruction Costs	$2.16 M	$2.16 M
Soft Costs	$8.64 M	$4.14 M
Unallocated Contingency Costs	$5.53 M	$2.56 M
Total Construction Costs (2016 $)	**$55.19 M**	**$30.23 M**

Table 30: South Corridor Operating and Maintenance Costs

BRT Operating Costs	$2.3 M
BRT Maintenance Costs	$1.3 M
Reductions to Local Service	-$.9 M
Total O&M Costs	**$2.7 M**

Table 31: South Corridor Daily Ridership

Opening Year (2016)	6,150
Future Ridership (2035)	7,000
TOD Enhanced Ridership (2035)	7,900

East Corridor

Runningway

The East Corridor begins at the Capitol Square and runs east along E. Washington Avenue It accesses Madison College via Wright Street and then returns to E. Washington Avenue via Stoughton Road. The alignment ends at East Towne Mall. Only Corridor BRT was analyzed for this alignment. The alignment is configured with approximately half side running lanes and half mixed traffic lanes, as shown in Table 32. The location of each type of runningway configuration is shown in Figure 27.

Major Destinations along this route:

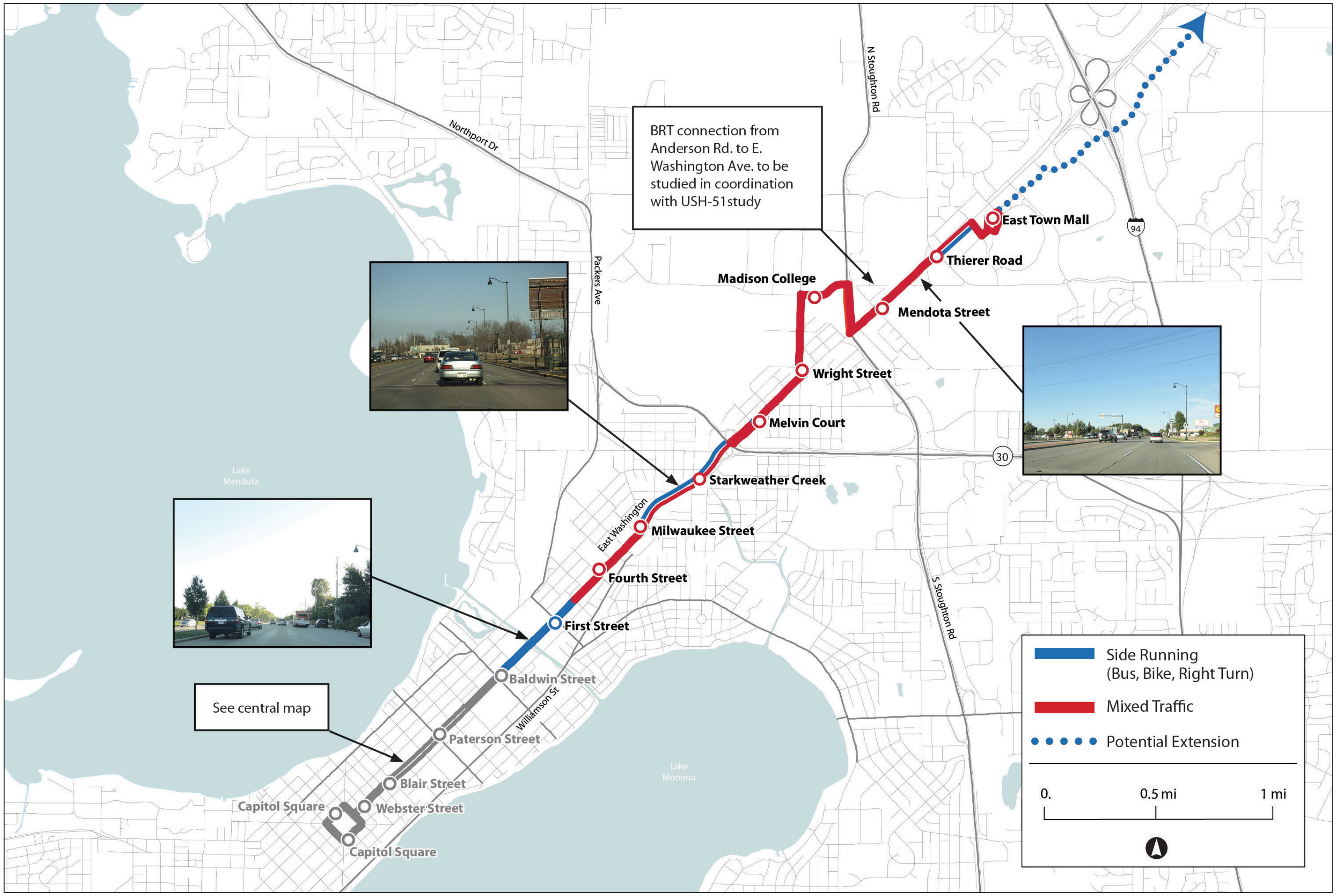
- Capitol Square
- The Isthmus
- Madison College
- East Towne Mall

Table 32: East Corridor Runningway Lengths

One-Way Corridor Length (miles)	6.28
Side Running Length (miles)	3.00
Mixed Traffic Length (miles)	3.28

Cross sections in Appendix O show how median side running lanes could fit into the current right-of-way in a typical location along the East Corridor.

Figure 27: East Corridor Runningways and Station Locations



East Corridor Stations

The East Corridor contains 15 stations per direction spaced on average 0.5 miles apart. Characteristics for each station are shown in Table 33. Approximately one half the stations are small stations and a little less than a quarter are medium shelters. Half of the stations are farside stations. There are 18 unconstrained stations in this corridor, adding to the estimated amount of purchased right-of-way necessary for this alignment.

Table 33: East Corridor Station Characteristics

Direction	Station Name	Shelter Size	Platform Type	Platform Location	Constrained/ Unconstrained Site
INBOUND	Capitol Square South	Existing	Existing	Existing	Existing
	Webster Street	Medium	Curbside	Farside	Unconstrained
	Blair Street	Small	Curbside	Nearside	Unconstrained
	Paterson Street	Medium	Curbside	Farside	Unconstrained
	Baldwin Street	Small	Curbside	Farside	Constrained
	First Street	Medium	Curbside	Farside	Unconstrained
	Fourth Street	Medium	Curbside	Nearside	Unconstrained
	Milwaukee Street	Medium	Curbside	Farside	Constrained
	Starkweather Creek	Small	Curbside	Nearside	Unconstrained
	Melvin Court	Small	Curbside	Farside	Unconstrained
	Wright Street	Small	Curbside	Nearside	Unconstrained
	Madison College	Large	Curbside	Nearside	Unconstrained
	Mendota Street	Small	Curbside	Farside	Constrained
	Thierer Road	Small	Curbside	Farside	Unconstrained
	East Towne Mall				
OUTBOUND	Capitol Square North	Existing			
	Webster Street	Medium	In-Lane	Farside	Constrained
	Blair Street	Small	Curbside	Nearside	Unconstrained
	Paterson Street	Medium	Curbside	Farside	Constrained
	Baldwin Street	Small	Curbside	Farside	Constrained
	First Street	Small	Curbside	Nearside	Constrained
	Fourth Street	Small	Curbside	Nearside	Constrained
	Milwaukee Street	Large	Curbside	Farside	Unconstrained
	Starkweather Creek	Small	Curbside	Farside	Unconstrained
	Melvin Court	Small	Curbside	Farside	Unconstrained
	Wright Street	Small	Curbside	Farside	Unconstrained
	Madison College	Large	Curbside	Farside	Unconstrained
	Mendota Street	Small	Curbside	Farside	Unconstrained
	Thierer Road	Small	Curbside	Farside	Unconstrained
	East Towne Mall	Large	Curbside	N/A	Constrained

Note: *Existing = Existing Shelters will be retained in this location and do not add to the cost estimate

Transfer Point

The East Corridor alignment does not connect directly to a transfer point.

Travel Time Estimates

The Transit Corridor Study's travel time estimates for the Easts Corridor are shown in Table 34. The best comparable existing transit route to compare to the proposed BRT alignment is the Route 6. Currently, traveling on the Route 6 from the Capitol Square to the East Towne Mall, via Madison College, takes 32 minutes. The proposed East Corridor alignment offers a 19 percent travel time savings over the Route 6.

Table 34: East Corridor Travel Time Estimates

BRT One-way Travel Time (minutes)	**26**
Current One-way Peak Transit Travel Time (minutes)	32
Projected Travel Time Savings (minutes)	6
Percent of Travel Time saved using BRT	19%
Current Peak Drive Time (minutes)	19

Transit Signal Priority (TSP)

The Transit Corridor Study assumed TSP technology can be implemented at the 16 intersections shown in Table 35.

Table 35: East Corridor Intersections Recommended for Further Consideration of TSP

Street 1	Street 2
Mifflin Street	Wisconsin Avenue
Carroll Street	Main Street
Mifflin Street	Carroll Street/State Street
Washington Avenue	Webster Street
Carroll Street	W. Washington Avenue
Main Street	Pinckney Street/King Street
Main Street	Martin Luther King Blvd., Jr.
Washington Avenue	Paterson Street
Washington Avenue	Baldwin Street
E. Washington Avenue	Aberg Avenue NB Ramps
E. Washington Avenue	Wright Street
Wright Street	Anderson Street
Anderson Street	Stoughton Road
E. Washington Avenue	Lien Road
E. Washington Avenue	Thierer Road/Portage Road
E. Washington Avenue	Eagan Road

Major Changes to Local Bus Service

The Transit Corridor Study assumed major route changes to three existing Metro Transit routes as part of BRT implementation in the East Corridor. The affected routes and the proposed operational changes are shown in Table 36 and Table 37. In all four cases replacing these local routes with BRT service provides increased frequencies in the corridor during peak hours, the midday and evening.

Table 36: East Corridor – Affected Local Routes

Route	Existing Service	Peak Hours	Midday	Evening
6	Runs from the West Transfer Point to the East Transfer Point via the Capitol Square	15	30	30
25	Two AM outbound and two PM inbound trips between the Capitol Square and the American Center	2 trips per peak period	n/a	n/a
26	Run in the midday from East Towne Mall to the American Center	n/a	60	n/a

Table 37: East Corridor - Proposed Operational Changes to Affected Local Routes

Route	Operational Change	Peak Hours	Midday	Late Evening
BRT	**All day service between East Towne Mall and the Capitol Square**	**10**	**15**	**30**
6	Replace service between the Capitol Square and East Towne Mall		*Replaced*	
13	Realign this route to run from the Capitol Square to E. Washington Avenue and Milwaukee Street	30	60	60
25	Replaced with all-day Route 26 service		*Replaced*	
26	Add service in the peak periods and increase service frequency	60	60	n/a

Redevelopment Potential

There is an abundance of redevelopment potential that has been defined in the *Capitol East District Plan*, a City of Madison district planning document, for which BRT would be a major driver for implementation. Almost every BRT station would have a positive impact on the redevelopment potential of adjacent properties.

Based on the analysis in the *Infill and Redevelopment Assessment*, the East Corridor has the potential to add approximately 4,000 housing units and 3.4 million square feet in commercial development. The location of the BRT stations will improve the potential for redevelopment for the following sites identified in the *Infill and Redevelopment Assessment:*

Station Location	Redevelopment Site
Webster Street	• City owned surface parking lot
Blair Street	• Multiple sites on either side of East Washington Avenue
Paterson Street	• Multiple sites on either side of East Washington Avenue
Baldwin Street	• Multiple sites
First Street	• Underutilized strip mall on the corner of First Street • Marling Lumber
Milwaukee Street	• Union Corners
Starkweather Creek	• Multiple small sites on either side of East Washington Avenue
Melvin Court	• Multiple sites clustered around the intersection of East Washington Avenue and Highway 30
Wright Street	• Two sites on the corner of Wright Street and East Washington Avenue
Mendota Street	• Significant redevelopment sites, primarily on the south side of East Washington Avenue
Thierer Road/East Towne Mall	• East Towne Mall redevelopment

East Corridor Results

The total estimated capital cost for building Corridor BRT in the East Corridor is $23.66 million, as shown in Table 38. Total annual costs to operate the BRT service is $3.0 million, with the proposed local service changes saving $1.0 million, resulting in a total net annual operating and maintenance cost of $2.0 million. Opening year daily ridership for the alignment is projected to be 3,530 riders and that estimate is expected to grow 13.8 percent by 2035. Assuming TOD influences, daily ridership is expected to grow by 24 percent by 2035.

Table 38: East Corridor Capital Costs

Alignment Configuration	East – Corridor BRT
Side Running Lane Improvements	$1.27 M
Median Running Lane Improvements	$0
TSP	$0.69 M
ROW Acquisition	$0.11 M
Station Costs	$8.09 M
Fleet Costs (includes 20% spare factor)	$8.27 M
Transfer Point Reconstruction Costs	$0
Soft Costs	$3.36 M
Unallocated Contingency Costs	$2.03 M
Total Construction Costs (2016 $)	**$23.82 M**

Table 39: East Corridor Operating and Maintenance Costs

BRT Operating Costs	$1.8 M
BRT Maintenance Costs	$1.2 M
Reductions to Local Service	-$1. M
Total O&M Costs	**$2.0 M**

Table 40: East Corridor Daily Ridership

Opening Year (2016)	3,530
Future Ridership (2035)	4,170
TOD Enhanced Ridership (2035)	5,180

North Corridor

Runningway

The North Corridor is 4.31 miles long. It begins at the Capitol Square and runs east on E. Washington Avenue. It then travels through the Yahara Busway, described below, and connects to Sherman Avenue It continues along Sherman Avenue until Northport Drive. The majority of the corridor runs in mixed traffic lanes. The total length of each type of runningway is shown in Table 41. The location of each type of runningway configuration is shown in Figure 28.

Major Destinations along the North Corridor route include:

- Capitol Square
- The Isthmus
- Northgate Mall
- Dane County Job Center
- Northside Town Center

Table 41: North Corridor Runningway Lengths

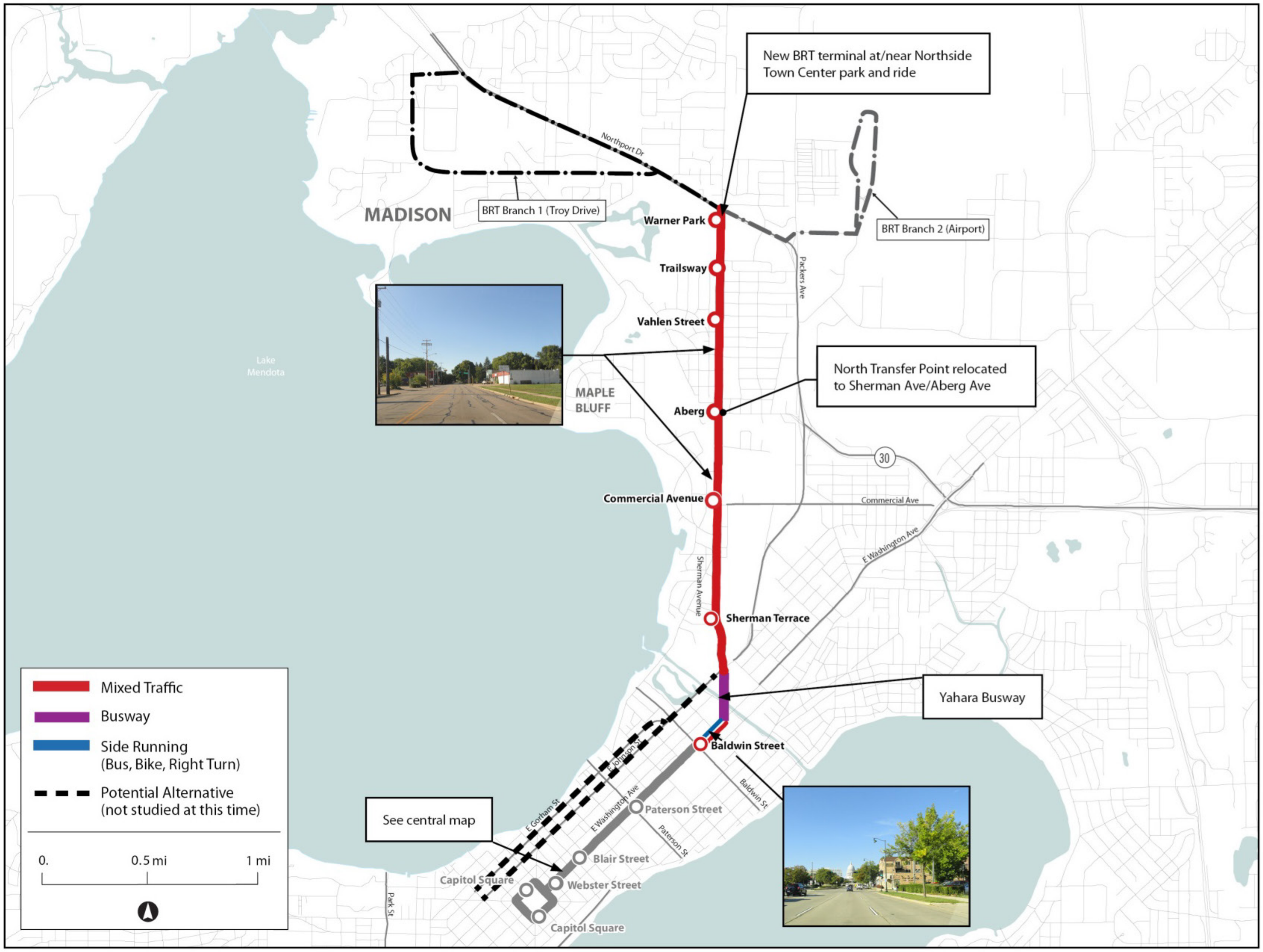
One-Way Corridor Length (miles)	4.31
Fixed Guideway Length - Yahara Busway (miles)	0.30
Side Running Length (miles)	1.50
Mixed Traffic Length (miles)	2.51

The Yahara Busway

The Yahara Busway is a short fixed guideway section that would need to be constructed and would only be accessible to BRT vehicles. The busway would connect E. Washington Avenue to Fordem Avenue adjacent to the existing railroad. Currently, the existing railroad tracks run diagonally across the Yahara River between E. Washington Avenue and E. Johnson Street. The location of the Yahara Busway is labeled on Figure 28. Several alternative routings were explored, including Johnson and Gorham Streets, Baldwin Street, First Street, North Street, Aberg Avenue, and Anderson Street. The Oversight Committee chose to study this short section of fixed guideway to avoid the congested and/or circuitous routing of these alternatives while maintaining the Sherman Avenue routing north of Johnson Street. The Yahara Busway reduces average travel times by an estimated one to two minutes compared to the First Street alternative, while improving reliability by eliminating turns at high-volume intersections and eliminating two railroad crossings. Although the Yahara Busway is a short fixed guideway section, the North Corridor configuration is still considered Corridor BRT.

The design of the Yahara busway would likely include one bus-only lane in each direction with unsignalized access at E. Washington Avenue and access to Fordem Avenue provided as the fourth leg of the intersection. A new bridge and at-grade railroad crossing would be required. A short, single-lane signalized section over the Yahara River may be effective at reducing the cost and footprint of the bridge while discouraging unauthorized access.

Figure 28: North Corridor Runningway Types and Station Locations



North Corridor Stations

The North Corridor contains 10 stations per direction spaced on average 0.4 miles apart. Characteristics for each station are shown in Table 42. The majority of the stations call for small shelters and a curbside platform configuration. The majority of stations are farside stations. There are 15 unconstrained stations on this alignment, adding to the estimated amount of purchased right-of-way necessary for this alignment.

Table 42: North Corridor - Shelter Characteristics

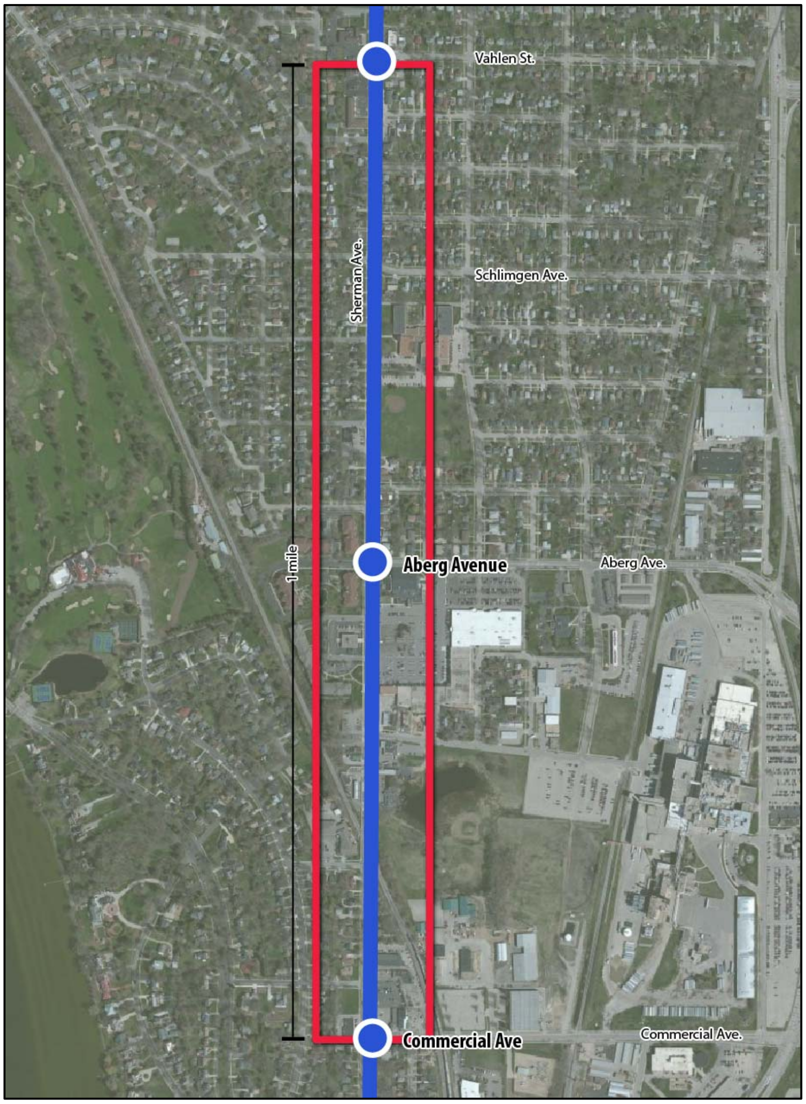
	Station Name	Shelter Size	Platform Type	Final Platform Location	Constrained/ Unconstrained Site
INBOUND	Capitol Square South	Existing*	Existing	Existing	Existing
	Webster Street	Medium	Curbside	Farside	Unconstrained
	Blair Street	Small	Curbside	Nearside	Unconstrained
	Paterson Street	Medium	Curbside	Farside	Unconstrained
	Baldwin Street	Small	Curbside	Farside	Constrained
	Sherman Terrace	Medium	Curbside	Midblock	Unconstrained
	Commercial Avenue	Small	Curbside	Nearside	Unconstrained
	Aberg Avenue	TP - Large	TP	N/A	Unconstrained
	Vahlen Street	Small	Curbside	Farside	Unconstrained
	Trailsway	Small	Curbside	Nearside	Unconstrained
	Warner Park	Large	Curbside	TBD**	Unconstrained
OUTBOUND	Capitol Square North	Existing	Existing	Existing	Existing
	Webster Street	Medium	Pull-out	Midblock	Constrained
	Blair Street	Small	Curbside	Nearside	Unconstrained
	Paterson Street	Medium	Curbside	Farside	Constrained
	Baldwin Street	Small	Curbside	Farside	Constrained
	Sherman Terrace	Medium	Curbside	Midblock	Unconstrained
	Commercial Avenue	Small	Curbside	Nearside	Constrained
	Aberg Avenue	TP - Large	TP	N/A	Unconstrained
	Vahlen Street	Small	Curbside	Farside	Unconstrained
	Trailsway	Small	Curbside	Farside	Unconstrained
	Warner Park	Large	Curbside	TBD**	Unconstrained

Note: *Existing - The existing shelters at the Capitol Square are retained and therefore are not included in the Transit Corridor Study cost estimate. **TBD – Final platform location to be determined.

Transfer Point

The Transit Corridor Study assumed the North Transfer Point would be relocated within one-half mile of the Aberg Avenue Station along Sherman Avenue, as shown in Figure 29; The Transit Corridor Study assumes a new transfer point would require approximately 1.5 acres of land. It also assumes that all routes currently serving the North Transfer Point would be rerouted to the new location.

Figure 29: Potential North Transfer Point Relocation Area



Travel Time Estimates

The Transit Corridor Study's travel time estimates for the North Corridor are shown in Table 43. The existing transit route used to compare to the proposed BRT alignment is a combination of the Route 2 and the Route 22. Currently, traveling on the Route 2 from the Capitol Square to the North Transfer Point, then transferring to Route 22, and finally departing at Warner Park takes 31 minutes. The proposed North Corridor alignment offers a 42 percent travel time savings over the Route 2 to Route 22 option, primarily due to less circuitous routing and the elimination of the transfer.

Table 43: North Corridor Travel Time Estimates

BRT One-way Travel Time (minutes)	18
Current One-way Peak Transit Travel Time (minutes)	31
Projected Travel Time Savings (minutes)	13
Percent of Travel Time saved using BRT	42%
Current Peak Drive Time (minutes)	15

Transit Signal Priority (TSP)

The Transit Corridor Study assumed TSP technology can be implemented at the 13 intersections shown in Table 44.

Table 44: Intersections Recommended for Further Consideration of TSP

Street 1	Street 2
Mifflin Street	Wisconsin Avenue
Carroll	Main Street
Mifflin Street	Carroll Street/State Street (RT)
Washington Avenue	Webster Street
Carroll	W. Washington Avenue
Main Street	Pinckney Street/King Street (LT)
Main Street	Martin Luther King Blvd., Jr.
Washington Avenue	Paterson Street
Washington Avenue	Baldwin Street
Fordem Avenue	Johnson Street
Sherman Avenue	Aberg Avenue
Sherman Avenue	Commercial Avenue
Sherman Avenue	Schlimgen Avenue

BRT Operating Plans

The North Corridor is the only corridor in the study with an operating plan that assumes BRT vehicles will leave the main BRT alignment and travel into surrounding areas. This service pattern was chosen by the Oversight Committee to improve service to the neighborhoods nearby Warner Park and Troy Drive and to the Dane County Regional Airport. The Transit Corridor Study assumes two BRT branches. BRT Branch 1 serves Troy Drive and Northport Drive using a loop similar to Route 22. BRT Branch 2 serves the Dane County Airport via Darwin Road. The routes of both branches are shown on Figure 28.

Alternating BRT trips serve each branch, meaning service along the branches is half as frequent as the service along the rest of the North Corridor alignment. For example, in the peak hour BRT branches will have a service frequency of 20 minutes while the rest of the north-south route has 10-minute service. No additional capital costs are associated with the North Corridor BRT branches beyond Warner Park, but it does effect the fleet requirement. 7 buses are required to provide service to the North Corridor alignment and alternating trips to the two extension areas. Both BRT branches are factored into the operating and maintenance cost estimates for the corridor.

Major Changes to Background Bus Service

The Study assumed major route changes to four existing Metro Transit routes as part of BRT implementation in the North Corridor. The affected routes and the proposed operational changes are shown in Table 45 and Table 46. Generally, replacing these local routes with BRT service provides increased frequencies in the corridor during peak hours, the midday and late evening. However, some of the route changes in the areas served by the BRT branches do minimally reduce frequencies and coverage in surrounding neighborhoods. The deletion of Route 29 results in a loss of some limited peak-period coverage north of Delaware Boulevard; however it provides much higher frequencies throughout the day on Sherman Avenue to the Northside Town Center park and ride. Replacing Route 22 with BRT Branch 1 reduces frequencies along Northport Dr. and Troy Dr. from 15 minutes to 20 minutes in the peak period.

Table 45: North Corridor – Affected Local Routes

Route	Existing Service	Peak Hours	Midday	Evening
20	East Towne Mall to Dane County Regional Airport and North Transfer Point	30	30	30
22	North Transfer Point to Northport Dr. and Troy Dr.	15	30	30
27	North Transfer point to the UW campus	30		
29	Two trips per peak period from the Lakeview area to the UW campus	2 trips per peak period	n/a	n/a

Table 46: North Corridor - Proposed Operational Changes to Affected Local Routes

Route	Operational Change	Peak Hours	Midday	Evening
BRT Branch 1*	**All day North Corridor BRT service branching to serve Troy Dr. and Northport Dr.**	**20**	**30**	**60**
BRT Branch 2*	**All day North Corridor BRT service branching to serve the Dane County Airport**	**20**	**30**	**60**
20	Replace the airport portion of the alignment with BRT Extension 2		*No Change*	
22	Replaced with BRT Extension 1		*Replaced*	
27	Replaced with BRT service		*Replaced*	
29	Replaced with BRT service		*Replaced*	

***** BRT Branches 1 and 2 combine for 10, 15, and 30-minute frequencies along the BRT corridor.

Redevelopment Potential:

Based on the analysis in the *Infill and Redevelopment Assessment*, the North Corridor has the potential to add approximately 600 housing units and 260,000 square feet in commercial development. The location of the BRT stations will improve the potential for redevelopment for the following sites identified in the *Infill and Redevelopment Assessment:*

Station Location	Redevelopment Site
Commercial Avenue	• Lakewood Plaza Shopping Center
Aberg Avenue	• Northgate Shopping Center and adjacent properties
Warner Park	• Northside Town Center

North Corridor Results

The total estimated construction cost for building Corridor BRT in the North Corridor, including vehicles, is $25.67 million, as shown in Table 47. Total annual costs to operate the BRT service is $3.0 million, with the proposed local service changes saving $1.1 million, resulting in a total net annual operating and maintenance cost of $1.9 million. Opening year daily ridership is projected to be 3,370 riders and that estimate is expected to grow 12.8 percent by 2035. Assuming TOD influences, daily ridership is expected to grow by 12 percent by 2035.

Table 47: North Corridor Capital Costs (2016$)

Alignment Configuration	North Corridor BRT
Side Running Lane Improvements	$0.65 M
Yahara Busway	$2.36 M
TSP	$0.6 M
ROW Acquisition	$1.09 M
Station Costs	$6.12 M
Fleet Costs (includes 20% spare factor)	$8.27 M
Transfer Point Reconstruction Costs	$2.16 M
Soft Costs	$4.02 M
Unallocated Contingency Costs	$2.55 M
Total Construction Costs (2016 $)	**$27.82 M**

Table 48: North Corridor - Annual Operating and Maintenance Costs (2012$)

	Corridor BRT
BRT Operation Costs	$1.8 M
BRT Maintenance Costs	$1.2 M
Reductions to Local Service	-$1.1 M
Total O&M Costs	**$1.9 M**

Table 49: North Corridor - Daily Ridership Projections

Opening Year (2016)	3,370
Future Ridership (2035)	3,800
TOD Enhanced Ridership (2035)	4,270

Corridor and System Summary

Table 50 through Table 55 shows a side by side summary of each corridor's attributes, travel times, capital costs, operating and maintenance costs, and ridership projections. Table 56 through Table 58 shows a summary of capital costs, operating and maintenance costs, and annual system ridership projections assuming the full build out of the proposed BRT system. In the system tables, overlapping corridor segments are removed while an overall maintenance facility component is added. Also for the system values, individual corridor ridership projections are adjusted to reflect overlapping segments.

Table 50: Corridor Attributes

Corridor	NORTH	SOUTH		EAST	WEST		
Type of Runningway	**Corridor**	**Fixed Guideway**	**Corridor**	**Corridor**	**Mineral Point - Fixed Guideway**	**Mineral Point - Corridor**	**Odana - Corridor**
One-way Corridor Length (miles)	4.31	5.50	5.50	6.28	7.76	7.76	8.61
Fixed Guideway Length (Miles)	0.30	3.40	-	-	4.30	-	-
Side Running Length (Miles)	1.50	1.10	4.20	3.00	2.10	5.10	2.70
Mixed Traffic Length (Miles)	2.51	1.00	1.30	3.28	1.36	2.66	5.91
Number of Stations per direction	11	16	16	15	17	17	19
Average distance between stations (miles)	0.43	0.37	0.37	0.45	0.49	0.49	0.48
Fleet Required (includes 20% spare factor)	7	9	9	7	11	11	11
Number of Intersections with TSP	13	17	17	16	20	20	24

Notes:

- Average distance between stations = Corridor length / (number of stations - 1)

Table 51: Corridor Travel Times

Corridor	Corridor Length (Miles)	BRT One-way Travel Time (minutes)	Current One-way Peak Transit Travel Time (minutes)	Projected Travel Time Savings (minutes)	Current Peak Drive Time (minutes)
North	4.31	18	31	13	15
South	5.50	30	38	8	16
East	6.28	26	32	6	19
West: Mineral Point	7.76	37	48	11	23
West: Odana	8.61	40	48	8	29

Notes:

- BRT One-way travel time: Total Travel Time = bus time in motion + traffic signal delay time + station dwell time
- Current One-way Peak Travel Time and Projected Travel Time Savings calculated using existing comparable transit routes (see below)
- Current Peak Drive Time based on Google Traffic estimates

Existing Comparable Transit Routes

- North: Route 2, from Capitol Square to North Transfer point combined with Route 22, from North Transfer Point to North Town Center
- South: Route 47, from Capitol Square to Caddis Bend
- East: Route 6 from Capitol Square to East Towne Mall, via Madison College
- West: Mineral Point - Route 57 from Capitol Square to West Transfer Point and Route 67 and Route 67, from West Transfer Point to West Towne Mall
- West: Odana- Route 2, from Capitol Square to West Transfer Point, and Route 67, from West Transfer Point to West Towne Mall

Table 52: Capital Costs

Corridor	NORTH	SOUTH		EAST	WEST		
Type of Runningway	**Corridor**	**Fixed Guideway**	**Corridor**	**Corridor**	**Mineral Point - Fixed Guideway**	**Mineral Point - Corridor**	**Odana - Corridor**
Side Running Lane Improvements	$0.65 M	$0.48 M	$1.79 M	$1.27 M	$0.9 M	$2.18 M	$1.15 M
Median Running Lane Improvements	$2.36 M	$18.59 M	$0	$0	$21.37 M	$0	$0
TSP	$0.6 M	$0.7 M	$0.7 M	$0.69 M	$0.76 M	$0.76 M	$0.79 M
ROW Acquisition	$1.09 M	$1.1 M	$1.1 M	$0.11 M	$2.23 M	$1.11 M	$0.1 M
Station Costs	$6.12 M	$5.23 M	$7.14 M	$8.09 M	$8.23 M	$9.56 M	$12.13 M
Fleet Costs (includes 20% spare factor)	$8.27 M	$12.76 M	$10.64 M	$8.27 M	$15.6 M	$13.0 M	$13.0 M
Transfer Point Reconstruction Costs	$2.16 M	$2.16 M	$2.16 M	$0	$2.16 M	$2.16 M	$2.16 M
Soft Costs	$4.02 M	$8.64 M	$4.14 M	$3.36 M	$10.75 M	$5.09 M	$5.38 M
Unallocated Contingency Costs	$2.55 M	$5.53 M	$2.56 M	$2.03 M	$6.96 M	$3.13 M	$3.26 M
Total Construction Costs (2016 $)	**$27.87 M**	**$55.19 M**	**$30.23 M**	**$23.82 M**	**$68.96 M**	**$36.99 M**	**$37.97 M**

Notes:

- Unit costs in 2012 dollars inflated at 3% per year to 2016 dollars
- Side Running Lane Improvements = $60 x length of route
- Median Running Lane Improvements = $550-$1000x length of route
- ROW Acquisition = $7 x square foot of needed space
- Station costs include the following types of items (varies by station location)
    - Shelters
    - Platform construction
    - Street signage
    - Automated signage
    - Traffic control
    - Parking
    - TVMs
    - Site improvements

- Fleet costs = $1M - $1.2M x peak fleet required per alignment + 20% spare factor
- Transfer Point base reconstruction = $1,600,000, additional charges relate to allocated contingency costs
- Unallocated contingency costs = Total Capital Costs per corridor x 15%
- No cost added to individual corridors for system maintenance facility requirements

Table 53: Corridor BRT O&M Costs (2012$)

Corridor	North	South	East	West: Mineral Point	West: Odana
Corridor Length	4.31	5.50	6.28	7.76	8.61
Annual Revenue BRT Bus Miles	291,000	258,000	294,000	364,000	404,000
Annual Revenue BRT Bus Hours	23,000	30,000	24,000	35,000	35,000
Vehicle Operations Costs	$1.8 M	$2.3 M	$1.8 M	$2.7 M	$2.7 M
Vehicle Maintenance Costs	$412,000	$365,000	$417,000	$515,000	$571,000
Non-Vehicle Maintenance	$401,000	$484,000	$403,000	$584,000	$594,000
BRT Maintenance Premium	$103,000	$91,000	$104,000	$129,000	$143,000
TVM Maintenance	$80,000	$66,000	$86,000	$139,000	$153,000
Station Maintenance	$41,000	$63,000	$59,000	$67,000	$76,000
Police/Fare enforcement	$152,000	$195,000	$153,000	$229,000	$229,000
Total O&M Costs (2012 $)	**$3.0 M**	**$3.6 M**	**$3.0 M**	**$4.4 M**	**$4.5 M**

Notes:

- Revenue Bus-Hours and Revenue Bus-Miles of service will be based on 255 weekdays, 52 Saturdays and 58 Sundays and holidays (holidays will be treated as Sundays). See the System tab for the span of service.
- Vehicle Operations Costs = BRT Annual Revenue Bus Hours x $75.61 (2011 Metro Transit Unit Cost)
- Vehicle Maintenance Costs = BRT Annual Revenue Miles x $1.39 (2011 Metro Transit Unit Cost)
- Non-Vehicle Maintenance Costs = 18.07% x (Vehicle Operations Costs + Vehicle Maintenance Costs)
- Premium for Articulated Buses = Annual BRT Revenue Bus-Mile x $0.35
- TVM Maintenance = Number of TVMs x $6,500
- Station/Stop Maintenance = Number of Directional Stops x $2,000
- Police/Fare Enforcement = BRT Annual Revenue Bus Hours x $6.50

Table 54: O&M Costs for Local Bus Service Changes (2012$)

Corridor	North	South	East	West: Mineral Point	West: Odana
Corridor Length	4.31	5.50	6.28	7.76	8.61
Annual Revenue Bus Miles	-134,000	-94,000	-133,000	-126,000	-123,000
Annual Revenue Bus Hours	-9,000	-8,000	-9,000	-10,000	-10,000
Vehicle Operations Related Costs	-$732,000	-$654,000	-$673,000	-$762,000	-$742,000
Vehicle Maintenance Costs	-$190,000	-$133,000	-$189,000	-$179,000	-$174,000
Non-Vehicle Maintenance Costs	-$167,000	-$142,000	-$156,000	-$170,000	-$166,000
Total O&M Cost Changes (2012$)	-$1.1 M	-$0.9 M	-$1.0 M	-$1.1 M	-$1.1 M

Notes:

- Revenue Bus-Hours and Revenue Bus-Miles of service will be based on 255 weekdays, 52 Saturdays and 58 Sundays and holidays (holidays will be treated as Sundays). See Table 2 for the proposed system frequency and span of service.
- Vehicle Operations Costs = Change in Annual Revenue Bus Hours x $75.61 (2011 Metro Transit Unit Cost)
- Vehicle Maintenance Costs = Change in Annual Revenue Miles x $1.39 (2011 Metro Transit Unit Cost)
- Non-Vehicle Maintenance Costs = 18.07% x (Change in Vehicle Operations Costs + Change in Vehicle Maintenance Costs)

Table 55: Corridor Ridership Projections

	Average Daily Ridership			Annual Ridership		
Corridor	**Opening Year Ridership Projection (2016)**	**Future Ridership Baseline Projection (2035)**	**TOD Adjusted Future Ridership Projection (2035)**	**Opening Year Ridership Projection (2016)**	**Future Ridership Baseline Projection (2035)**	**TOD Adjusted Future Ridership Projection (2035)**
North	3,370	3,800	4,270	0.86 M	1.16 M	1.30 M
South	6,150	7,000	7,900	1.87 M	2.13 M	2.41 M
East	3,530	4,170	5,180	1.08 M	1.27 M	1.58 M
West: Mineral Point	8,780	9,670	10,650	2.27 M	2.95 M	3.25 M
West: Odana	8,930	9,790	10,760	2.72 M	2.99 M	3.28 M

Notes:

- Existing ridership is based on 2011 Metro Ridership data and used a 1/8 mile buffer around existing bus stops to create an existing baseline ridership for the proposed alignments.
- Opening Year (2016) and Future (2035) Ridership Projections are based on current land use patterns.
- TOD Adjusted Future Ridership Projections are based on transit oriented development (TOD) at key station areas.
- The West - Mineral Point Road alignment projections includes riders from the relocated West Transfer Point.

Table 56: System Summary – Capital Costs

	MINERAL POINT OPTION		ODANA OPTION
	Full System Corridor BRT	**Fixed Guideway BRT in West & South Corridors**	**Corridor BRT**
North Segment	$10.6 M	$10.6 M	$10.6 M
South Segment	$13.6 M	$33.5 M	$13.6 M
East Segment	$8.9 M	$8.9 M	$8.9 M
West Segment	$18.2 M	$41.7 M	$18.8 M
Central Segment	$7.0 M	$7.0 M	$7.0 M
Subtotal	$58.3 M	$101.7 M	$59.0 M
Required Fleet Costs	$40.2 M	$44.9 M	$40.2 M
Contingency Costs	$8.7 M	$15.3 M	$8.8 M
Bus Maintenance Facility	$30.0 M	$30.0 M	$30.0 M
TOTAL SYSTEM CAPITAL COSTS (2016 $)	**$137.2 M**	**$191.8 M**	**$138.0 M**

Notes:

- System maintenance facility cost for fleet of 34 articulated vehicles
- Required Fleet Costs for the Fixed Guideway option assumes right and left-side doors. Corridor BRT assumes right-side doors only.
- Segment Descriptions
  - North Segment = Runningway and stations north of Baldwin Street
  - South Segment = Runningway and stations south of Park Street
  - East Segment = Runningway and stations east of Baldwin Street
  - West Segment = Runningway and stations west of Park Street
  - Central Segment = Runningway and stations between Park Street and Baldwin Street

Table 57: System Summary – Annual Operating and Maintenance Costs

	MINERAL POINT OPTION		ODANA OPTION
	Full System Corridor BRT	**Fixed Guideway BRT in West & South Corridors**	**Corridor BRT**
BRT System O&M Costs	$13.8 M	$13.8 M	$13.9 M
O&M Background Bus Cost Changes	-$4.1 M	-$4.1 M	-$4.1 M
Net O&M BRT Costs (2012 $)	$9.7 M	$9.7 M	$9.8 M

Table 58: System Summary – Annual System Ridership Projections

	MINERAL POINT OPTION		ODANA OPTION
	Full System Corridor BRT	**Fixed Guideway BRT in West & South Corridors**	**Corridor BRT**
Annual Opening Year Ridership Projection (2016)	4.7 M	4.7 M	4.8 M
Future Ridership Baseline Projection (2035)	5.2 M	5.2 M	5.2 M
TOD Adjusted Future Ridership Projection (2035)	6.0 M	6.1 M	6.0 M

Evaluation of Project Goals

The Oversight Committee created nine goals for the assessment of how well BRT might fit in Madison. How well the corridors fulfill each goal is presented below.

Goal 1: Reduce Travel Times

The first goal of the proposed BRT system was to reduce the time transit passengers currently spend traveling from point A to point B along Madison's four primary transit corridors. The Transit Corridor Study evaluated this goal by comparing the travel time estimates for the proposed BRT system to existing peak transit travel times in the four corridors. Travel time savings for each of the study's alignments are shown below in Table 59 and represent the time it takes to travel from one end of the corridor to the other. The North Corridor sees the largest time savings, cutting the alignment's current end to end travel time almost in half. The other four alignments also see significant travel time savings, ranging from 17 to 23 percent. The proposed BRT configurations clearly fulfill the committee's first project goal in all four corridors.

Table 59: Travel Time Savings

Alignment	Corridor Length (Miles)	BRT One-way Travel Time (minutes)	Current One-way Peak Transit Travel Time (minutes)*	Projected Travel Time Savings (minutes)	Time Savings (%)
North	4.31	18	31	13	**42%**
South	5.50	30	38	8	**21%**
East	6.28	26	32	6	**19%**
West: Mineral Point	7.76	37	48	11	**23%**
West: Odana	8.61	40	48	8	**17%**

Note: See the description of each corridor for the existing routes chosen for the current one-way peak transit travel time comparison.

Goal 2: Attract New Transit Riders

The second goal for the proposed BRT system was to attract new passengers to the system. This goal was evaluated by comparing the number of new riders attracted to each corridor. As discussed early in this study, each alignment's ridership projection includes a projection of the number of new riders attracted by BRT's comfort, convenience, and reliability. The projections for each corridor, based on the improvements in frequency, speed, and comfort, are shown in Table 60. The west and south alignments show the highest level of new riders, each drawing over 1,000 estimated new daily riders apiece. The South alignment is also fairly successful at attracting new riders in comparison to the other corridors, with 713 new transit riders. It makes sense that the west and south alignments have the largest estimates of new riders, because both travel through the downtown and the UW-campus area. This area has some of the highest ridership in the existing system as well as some of the city's highest levels of population density, both factors that provide a strong base for ridership projections.

Table 60: New Transit Riders - Daily Ridership

Alignment	New Riders Attracted by BRT Service	Total BRT Ridership (2016)	% of New Riders
North	430	3,370	13%
South	713	6,150	12%
East	331	3,530	9%
West: Mineral Point	1,150	8,780	13%
West: Odana	1,170	8,930	13%

Note: Ridership forecasts are presented for each individual corridor. System-wide ridership forecasts are shown in Table 58

Goal 3: Improve connections between low income and/or transit dependent neighborhoods and centers of employment and activity

The third goal of the project was to improve the connections between low income and/or transit dependent neighborhoods and centers of employment and activity in the Madison area. To measure how well the proposed system achieved this goal the Transit Corridor Study compared existing transit travel times to travel times on the proposed BRT system between a sample of origins located in low income and/or transit dependent areas to an employment or activity center. Origin locations were chosen from areas that had a high concentration of low income populations or if they had a large percentage of households that do not own cars[2]. Origin locations also are within 1/3 of a mile of an existing transit route. Destinations were assigned to locations with high concentrations of employment and/or popular shopping destinations[3].

The twelve origin and destination pairs and both the existing and BRT travel times are shown in Table 61. The origin and destination locations are shown on Figure 30. For origins not located directly on a proposed BRT line, it was assumed the passenger would travel to a transfer point via an existing local bus route and then transfer to the BRT line. Travel time estimates were calculated in the midday.

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[2] ACS 2010 5-year summary file data was used to locate high concentrations of low income populations and areas with large percentages of households that do not own cars.

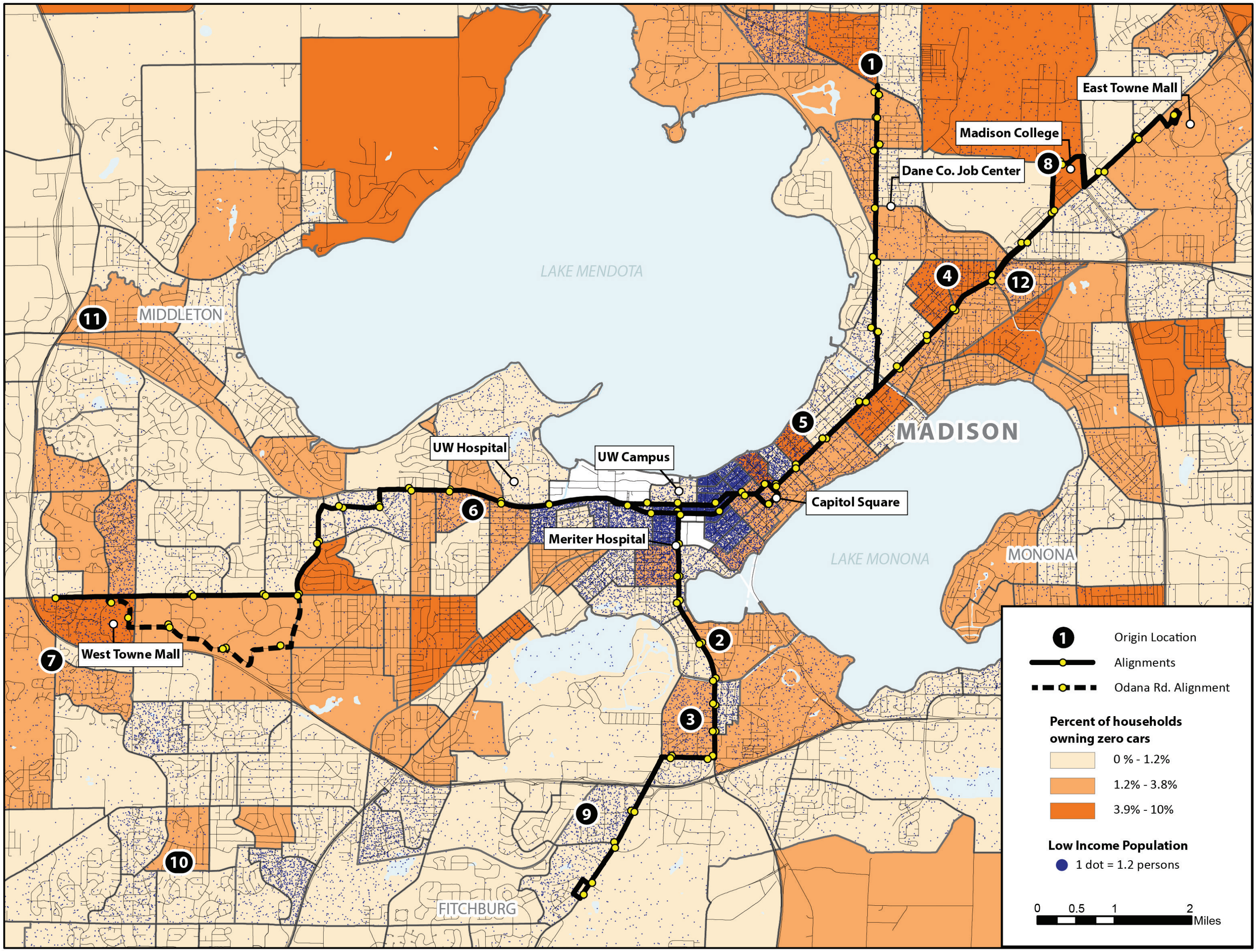
[3] The 2010 Longitudinal Employer-Household Dynamics (LEHD) data from the US Census Bureau was used to locate area with high employment concentrations.

Table 61: Low Income/Transit Dependent Origin Destination Pairs

	Origin Intersection		Closest Corridor	Major Employment and/or Shopping Area	Existing transit in-vehicle travel time (minutes)	Proposed in-vehicle service travel time (minutes)	Difference (minute)	% Time Savings
1	Thackeray Rd	N Sherman Ave	North	Meriter Hospital	41	24	-17	41%
2	W Olin Ave	Lowell St	South	Dane County Job Center	36	23	-13	36%
3	Cypress Way	Dane Street	South	Madison College	44	30	-14	32%
4	E Johnson St	North Street	East	East Towne Mall	20	15	-5	25%
5	E Gorham St	N Paterson St	East	West Towne Mall	48	38	-10	21%
6	Shepard Terrace	Kendall Avenue	West	Capitol Square	16	13	-3	19%
7	Watts Road	S High Point Rd	West	Capitol Square	41	35	-6	15%
8	Wright St	Anderson St	East	Capitol Square	19	18	-1	5%
9	Luann Ln	Greenway Cross	South	West Towne Mall	33	32	-1	3%
10	Sara Rd	Putnam Rd	West	UW Campus	38	38*	0	0%
11	University Ave	Parmenter St	West	UW Hospitals and Clinics	36	36*	0	0%
12	Milwaukee St	Portland Pkwy	East	UW Campus	25	25*	0	0%

*Note: Using existing local routes would be faster than using BRT to make this trip; therefore it is assumed passengers would continue to use local routes and would not see a difference in travel times.

Figure 30: Low Income/Transit Dependent Origin Destination Pair Locations



When the existing and proposed travel times were compared, the proposed system provided an average 15 percent travel time savings. While passengers at certain origin locations would still be better served by local routes (pairs 10, 11, and 12), the large majority of these trips would be faster using the proposed BRT system. Of the nine origin/destination pairs that experience a faster travel time by using the proposed system, seven pairs experience significant decreases in travel times ranging from 15 to 41 percent time savings. Looking at these twelve pairs, it can be concluded that the proposed system does a good job of improving connections between low income and/or transit dependent neighborhoods and centers of employment and activity.

Goal 4: Provide expanded carrying capacity

The fourth goal for the project was to provide expanded carrying capacity to the current transit system. The Transit Corridor Study measured the proposed system's ability to provide expanded carrying capacity by comparing existing carrying capacities to the proposed BRT system's carrying capacities at eight screen line locations along the corridors. Two types of screen line locations were assigned to each corridor, one location closer to Madison's downtown and one location closer to end of the proposed BRT lines. Carrying capacities were calculated at each location by multiplying the number of buses passing through the screen line per hour by the carrying capacity of each bus. The study assumes the 40-foot buses currently used by Metro Transit can carry a maximum of 53 people (38 seated plus 15 standees). The study assumes a 60' articulated BRT vehicle can carry a maximum of 84 people (59 seated plus 25 standees). Existing passenger capacities and proposed passenger capacities at all size screen line locations are shown in Table 62. The large percent increases between the existing system's carrying capacity and the carrying capacities possible with BRT plus existing local service demonstrate that implementing a BRT system as a complement to local service would greatly increase the transit system's carrying capacity at all eight locations during both the peak hour and the midday. The greatest gains in carrying capacity in all four corridors are seen in the midday when existing service is at its lightest. All parts of the proposed system would see expanded carrying capacities with the implementation of the proposed BRT system.

Table 62: Existing versus Proposed Passenger Capacity per Hour

		Hourly Passenger Capacities						% Increase	
Corridor	**Screen Line Location**	**Existing Peak**	**Existing Midday**	**BRT Peak**	**BRT Midday**	**BRT + Existing Peak**	**BRT + Existing Midday**	**Peak Hour**	**Midday**
West	University Ave. at Midvale Blvd.	636	212	504	336	1,140	548	**79%**	**158%**
South	S. Park St. at Wingra Dr.	212	106	504	336	716	442	**238%**	**317%**
East	E. Washington Ave. at Milwaukee St.	795	212	504	336	1,299	548	**63%**	**158%**
North	Sherman Ave. at Aberg Ave.	318	106	504	336	822	442	**158%**	**317%**

Source: Existing Peak and Midday passenger capacities based on 2010 Transit Service Frequencies.

Note: The BRT Peak and Midday frequencies do not take into account local bus service changes proposed in the Transit Corridor Study, therefore some small reductions in the passenger capacity percent increase may occur.

Goal 5: Improve operational efficiencies

Besides slow travel times, a common complaint about Metro Transit's existing operations is overcrowded buses. Metro Transit tracks the routes in the existing local bus system that are consistently reported as overcrowded. The eight commonly overcrowded routes are listed below in Table 63. On the whole, the majority of these eight routes run parallel or very close to the proposed BRT alignments, meaning the proposed system's expanded carrying capacity, discussed in Goal 4, would help improve operational efficiencies by reducing the need for extra buses to be deployed.

Table 63: Commonly Overcrowded Routes

Commonly Overcrowded Routes	Located in BRT Corridors	Specific Overload Location	Will new BRT system alleviate overcrowding?	Reasoning
2	West & North	University Avenue Corridor	Yes	The BRT system significantly increases capacity in the University Avenue Corridor.
4	South & North	Mills Street	Most likely	Increasing the service level on Park Street is likely to attract some ridership currently on Route 4.
6	East, South	UW Campus, East Washington Avenue, Madison College	Yes	Midday service at Madison College is increased from hourly to every 15 minutes. East Washington Avenue and N. Park Street capacity is increased.
14	West East	University Avenue, East Washington Avenue	Yes	Frequent service to Hill Farms relieves loading on Route 14 and allows it to be rerouted from Sheboygan Avenue to Regent Street. High peak-period loads to the East Transfer Point will likely continue.
15	West & East	University Avenue Corridor, East Washington Avenue	Yes	Frequent service to Hill Farms relieves volume on Route 15 and allows it to be rerouted from Sheboygan Avenue to Old Middleton Road. High peak-period loads to the East Transfer Point will likely continue.
28	North	Johnson and Gorham Streets	Not likely	Johnson and Gorham Streets are not served by the BRT alignments studied, although some volume north of Johnson Street may be relieved
38	East	UW Campus, Jenifer Street, Broom/Bassett Streets	No	The areas generating overloads are not served by the BRT system.
71/72	West	Middleton/ University Avenue	Not likely	Middleton is not directly served by the BRT system, although some loading along University Avenue may be relieved.

Goal 6: Provide an enhanced image for transit service

The Transit Corridor Study's proposed system provides an enhanced image of transit by holding the system's planned stations and vehicles to very high design standards. The stations proposed in the study are intended to be the system's primary identity element and will project a feeling of physical permanence similar to that of an LRT station. Cost estimates for the stations include highly visible elements such as large, lighted station markers and public art. Proposed shelter designs are shown earlier in the report in Figure 8 through Figure 11.

Also, the fixed guideways proposed in the West and South Fixed Guideway BRT configurations would add to the visual impact of the stations and heighten the public's awareness of the system. The proposed BRT vehicles will also be uniquely branded to differentiate them from local bus service and help call attention to the improved transit service. Overall, the distinctive design features of both the system's stations and vehicles will improve the image of transit in the area.

Goal 7: Improve the comfort and convenience of the transit experience

The Transit Corridor Study's BRT system improves the comfort and convenience of the transit experience through both its proposed operating plan and through the amenities offered at the station locations and onboard the BRT vehicles. First, the operating plan ensures the system is convenient by running at high frequencies throughout the day. With a bus passing by each station every ten minutes during the peak hours and every fifteen minutes during the midday, customers will be able to rely on the system without consulting complicated schedules and without fear of missing a bus. Using the screen line locations discussed in Goal 4, Table 64 shows that with the proposed BRT service overlaid on top of the existing local bus service is provides increased frequencies across the entire system. The increase in frequencies is especially large at the locations furthest away from the downtown area.

The planned amenities at the BRT stations and onboard the BRT vehicles also increase comfort and convenience for passengers. The option for off-board fare payment is easy and automatic with smart card readers at every station and it also speeds service by decreasing the time spent waiting for passengers to pay as they board. Dynamic signage placed at medium and large stations take away the mystery of when the next bus will arrive. Onboard the vehicles, passengers could use the proposed wi-fi service and those making multi-modal trips will be able to store their bicycles on board, keeping them safe and dry. These amenities in conjunction with the system's frequent operating plan will offer a very high level of comfort and convenience to transit passengers.

Table 64: Local Peak Frequencies versus Proposed BRT Frequencies

Corridor	Screen Line Location	Existing Avg Peak Frequencies (minutes)	Existing Avg Midday Frequencies (minutes)	Proposed BRT Peak Frequencies (minutes)	Proposed BRT Midday Frequencies (minutes)	BRT + Existing Peak (Minutes)	BRT + Existing Midday (Minutes)
West	University Ave. at Midvale	5	15	10	15	3	8
South	S. Park St. at Wingra Dr.	15	30	10	15	6	10
East	E. Washington Ave. at Milwaukee St.	15	30	10	15	3	8
North	Fordem Ave. at Sherman Ave.	< 15	30	10	15	6	12

Note: The Proposed BRT Peak and Midday frequencies do not take into account local bus service changes proposed in the Transit Corridor Study, therefore some small increases in the BRT + Existing frequencies may occur.

Goal 8: Integrate well with the existing and planned transit system

The proposed system is designed to be integrated into the existing transit service. It augments existing peak hour routes and increases the all-day service. It connects with three of the four major transfer points. Local service is intended to use the BRT stations, or stops close by, so riders can transfer or take whichever bus comes first. For people who do not live or travel to destinations directly on the BRT corridor, they may still benefit from the improvements. For instance, many people in southwest Madison take local service to the West Transfer Point, then transfer to continue their journey to downtown Madison. BRT would save them a substantial amount of time over transferring to Route 2 or Route 6.

The proposed system also fulfills multiple goals for public transit as stated in the MPO's 2035 Regional Transportation Plan Update, the first and foremost being to study and plan for the implementation of a high-capacity rapid transit service in the Madison area. As described above, the proposed system would also incrementally improve and expand local bus service through service extensions and increased frequencies, another goal from the 2035 Regional Transportation Plan update. Lastly, also in line with the plan update, the proposed system has the ability to improve express commuter service from peripheral neighborhoods.

Goal 9: Enhance opportunities for transit-oriented development (TOD)

The ninth goal of the proposed BRT system is to facilitate and support infill redevelopment along the corridor routes. Based on CARPC's analysis in *The Infill and Redevelopment Assessment*, the BRT system will have a positive impact on infill redevelopment with the potential to add a total of 7,200 housing units and 7,110,000 square feet in commercial space over the long term depending on market demand (see corresponding market study). The majority of this development is anticipated to occur in the short (0-10 years) and mid-term (10-20 years). If the West Corridor uses the Odana Road alternative, the total potential housing units will increase to 8,340 and the total commercial space will increase to 7,880,000 square feet. Of the four routes, the BRT system could have a significant impact on the redevelopment in the East Corridor.

Route	Housing Units	Commercial Space (SF)
East Corridor	4,020	3,410,000
West Corridor	1,460	2,280,000
South Corridor	1,120	1,290,000
North Corridor	600	260,000
Total	**7,200**	**7,110,000**
Alternative Routes Total*	**8,340**	**7,880,000**

Source: *Infill and Redevelopment Assessment*, CARPC. See Appendix M.

Note:* West Corridor Odana Road Alternative provides additional development potential (1,140 housing units and 640,000 square feet of commercial space

Table 65: Evaluation Summary

	Goal	Result
1.	**Reduce travel times**	17% - 42% reduction in in-vehicle transit travel time using BRT service.
2.	**Attract new transit riders**	9% - 13% of estimated BRT riders expected to be new transit users.
3.	**Improve connections between low income and/or transit dependent neighborhoods and centers of employment and activity**	Average of 15% savings in in-vehicle transit travel times for trips between low income/transit dependent areas to major destinations using BRT service.
4.	**Provide expanded carrying capacity**	78% - 158% increase in peak period carrying capacities along major corridors and 158% to 317% increase in midday carrying capacities.
5.	**Improve operational efficiencies**	Likely able to relieve overcrowding on 5 of 8 current problem routes.
6.	**Provide an enhanced image for transit service**	Identification of BRT runningways, unique stations and vehicles will positively influence the image of transit service within the community.
7.	**Improve the comfort and convenience of the transit experience**	3 to 6 minute blended (local + BRT) peak service frequencies along key points versus current level of 5 to 15 minutes. Station and on-vehicle amenities as well.
8.	**Integrate well with the existing and planned transit system**	Connecting service to BRT lines identified to serve outlying and off-line destinations.
9.	**Enhance opportunities for transit-oriented development (TOD)**	Significant infill opportunities provided.

Madison BRT: Next Steps

Implementing BRT in Madison will require close coordination among major stakeholders to complete the project development process. The City of Madison and Metro Transit will have significant roles in completing design, construction and operation of any BRT configurations selected for implementation. BRT is well suited for incremental development, so identifying key stages and the funding arrangements for each stage is a logical first step toward implementation. Overall system benefits will accrue immediately upon implementation, so early action that builds upon community interest and support will be well received. Metro Transit, the City of Madison, the public, and others should generally be comfortable with the concepts that involve major changes to the transit system or transportation network.

Identification of BRT Stages

One of the first steps toward implementation of BRT in Madison will be to identify the most promising corridors and segments for further consideration. Regional and city stakeholders need to select one or more corridors for initial development based on the balance of costs and benefits. Once the corridors are prioritized, each should be assessed individually to determine if stages will be required within the corridors to build out the full alignment. Staging might be required to tie-in with other local construction initiatives, jurisdictional issues, limited funding or development that will be coming in forward years.

Detailed Design and Environmental Analysis

This study has identified and tested several BRT concepts for potential implementation in Madison. Planning assumptions were carefully reviewed with stakeholders to ensure reasonable test conditions were in place, but before proceeding to implementation, concept designs need to be replaced with detailed design activities. This will include design of the runningways and stations including all of the components necessary to operate and maintain the BRT service. The detailed engineering phase is the basis for final cost estimates as well as assessment of impacts related to any environmental analysis that may be required locally. Detailed drawings for each construction segment will need to be prepared showing all design requirements including any right of way needs. One of the key components within this work will be station locations and designs.

Funding

Financing BRT projects can be accomplished through mechanisms and programs similar to those used for other transit initiatives. Most major transit improvements are financed with combinations of local, state, and federal funds and some level of debt financing.

On the federal level, there is no specific funding program related specifically to BRT projects. Major high capacity transit projects from BRT to light rail, commuter rail, and subway/elevated urban rail systems have utilized funds from the Federal Transit Administration (FTA) through the New Starts program, and funding is very competitive across the country.

Within the New Starts program is the Small Starts program that is aimed at providing assistance to lower cost BRT and streetcar projects. Projects need to be less than $250 million in total, with the federal share at less than $75 million. Competition for Small Starts funding is also very competitive with awards from the FTA based on overall project ratings. These BRT projects do not need to be operated in their own right-of-way and can be corridor-based, but need to include specific elements like BRT branding, frequent service, and transit signal priority. A project using Small Starts funds would need to conform to a specific project development process, including Alternatives Analysis, Project Development, Project Construction Grant Agreement, and Construction. Some of the results from this study may be used for the Alternatives Analysis phase. Federal funding from Urbanized Area Formula Grants and the Bus Capital program has also been used for BRT projects. However, funding under the Formula Grant program completes locally with other transit system needs including bus fleet procurement and major vehicle and facility overhauls.

State and local funds may also be available to implement BRT in Madison. Direct state appropriations, revenue backed bonds and local tax or assessment districts may be available to help finance the system. Formation of a regional transit authority (RTA) would help facilitate implementation by providing a solid local funding base. RTAs are currently allowed in many states, but are not allowed in Wisconsin. RTA enabling legislation was enacted in 2009 and rescinded in 2011. Funding for BRT and other transit service through an RTA would likely be from a sales tax in a district encompassing the metropolitan area.

Community Engagement

The conceptual design activities have raised local interest in possible BRT design and operations. To go beyond this level will require broader engagement of the local community to reach agreement on service and design details. There should be opportunities to discuss the BRT concepts at the neighborhood level under the upcoming City of Madison Transportation Master Plan process. Additional focused outreach should be conducted as part of the detailed design activities. Topics should include station locations, station designs, program requirements, BRT service configurations, and local bus connections.

BRT Supportive Policies

Land use and parking policies are areas that can be supportive of BRT investment by helping to generate and accommodate potential riders. Land use planning around station areas should begin as early as possible to engage the neighborhoods and business community in crafting a vision for transit-supportive development. A blend of trip generator and trip attractor land uses can support all-day, two direction BRT service. Land use policies or zoning regulations may need to be adjusted to encourage high density and transit-oriented development.

Parking availability at stations will also influence ridership especially at outlying stations. Neighborhood parking policies and identification of regional park and ride opportunities also needs to be clarified before implementation.

In the short term, broader transportation policies and priorities may be reviewed to facilitate incremental steps toward BRT. For instance, transit service change concepts may prioritize fast, direct, ridership-stimulating investments over competing service coverage expansions and commuter services, which are also important. Transit speed and reliability improvements like transit signal priority, in-lane bus stops, and bus-only lanes may be included in road reconstruction and channelization projects.

Branding

Branding a BRT service gives it a unique identity locally. This identity can be used to market the service as something clearly different than other local transit services and build customer loyalty and support. To jump start this effort it will be necessary to identify:

- Who is the target audience?
- What makes BRT sellable to the audience?
- How to communicate to the audience?

Likely components of the branding strategy include:

- Name of service
- Color schemes and logos
- Features to highlight
- Customer information components
- Publication materials

Transit Signal Priority

The preliminary review of potential application of transit signal priority along the proposed BRT corridors in Madison has identified where slack time is available on non-TSP phases that could be transferred to TSP phases. Ninety-nine signalized intersections along the BRT corridors were reviewed to identify available slack time. Fifty-eight were recommended for further consideration of TSP to benefit BRT operations. A thorough review of those intersections should be completed prior to design activities to ensure that buses will benefit from the investment and traffic flow will not be negatively impacted in a significant way. A pilot study is recommended to prove the concept of TSP.

Local Bus System Redesign and Transit Facilities

The implementation of BRT service in Madison needs to incorporate a thorough review of all the other transit services and facilities within the area. As BRT services are overlaid within corridors, some existing services will be modified or replaced by BRT. The level of service for remaining routes and the determination of whether they are through-routed or modified to become BRT feeders needs to be carefully evaluated to meet the community needs. Extensive public involvement for this service redesign should be considered.

As part of this review, the locations and sizing of the transfer points should be evaluated to ensure these continue to function as needed within the overall metro system. The gravity of expanding or relocating a transfer point cannot be overstated. Along with this review, opportunities to add park and ride facilities in strategic locations around the community should be evaluated. Park and ride could greatly enhance peak period ridership on the BRT system.

The vehicles envisioned for BRT service in Madison are 60-foot articulated vehicles not currently operated by Metro. Adding these vehicles to the fleet will cause several concerns that should be analyzed prior to implementation. Parallel on-going studies, such as the Bus Size Study, are investigating these constraints in more detail.

Transit Operations

Metro Transit makes extensive use of route interlines to maximize driver scheduling efficiency. Introduction of BRT service with unique vehicles will disrupt the current scheduling patterns along some key corridors. Before BRT implementation it will be necessary for Metro staff to evaluate the overall scheduling process to identify the full impact of BRT implementation. Locations and policies related to driver relief, layover and recovery time may also need to be reviewed to ensure smooth integration of BRT service.

Sustainable Communities Planning

Implementation of BRT in Madison will have a positive impact on a number of sustainable communities' principles by expanding transportation choices within the community and supporting transit-oriented development. The potential for BRT to impact other key livability measures including reduction in vehicle miles traveled (VMT) and emissions within the area, along with the potential to increase the proportion of low income households within a 30 minute commute, will need to be further evaluated before implementation.

Potential Future Extensions

The BRT system evaluated in this document represents a network that can be implemented within the time-frame of the Regional Transportation Plan, with a horizon year of 2035, and be supported by existing land uses and transit ridership. However, future extensions are possible as shown Figure 20. With sufficient funding and support, some of these extensions could also be brought online before 2035. The future extensions would expand the BRT network into areas not served by the four primary corridors (Middleton, southwest Madison, Fitchburg, east Madison, and northeast Madison), and also extend lines into planned transit oriented development areas (University Research Park Phase 2 and Nine Springs neighborhood).

Madison Area Transportation Planning Board – A Metropolitan Planning Organization (MPO) Transit Corridor (BRT) Study

Public Involvement Plan

5/8/2013

Prepared by the Urban Assets, LLC on Behalf of the
SRF Consulting Group Team

Table of Contents

Contents. 1
Contact List 3
- **Transit Corridor Study Steering Committee** 3
- **Consultant Team** 4

Project Description 5
- **Background** 5
- **Study Overview** 5
- **Goal of the Public Involvement Process** 7
- **Challenges, Opportunities, & Solutions** 7
- **Engaging the Greater Madison Community** 9
- **BRT Transit Corridor Study Public Participation Timeline** 10
- **Related Planning Efforts** 11

Goals, Objectives, and Expected Outcomes 11
- **Goals and Objectives of the Public Involvement Process** 12

Stakeholders, Participants, and Audiences 12
- **Public Agencies** 12
- **General Public** 13
- **Business Community Leaders** 14
- **Students** 15
- **Transit Riders** 15
- **Matrix of Stakeholders and Public Involvement Techniques** 15

Public Involvment Techniques 15
- **Oversight Committee** 16
- **Workshop** 16
- **City / County Commission Meetings** 16
- **eBlast Announcements** 17
- **Focus Groups** 17
- **Public Meetings** 17
- **Other Input/Outreach** 17
- **Website** 18
- **Roles and Responsibilities** 18

Results From Public Involvement Activities……………………………………………………………… 19
  Results From Public Meeting One……………………………………………………………………… 19
  Station Review and Community Input………………………………………………………………. 19
Results From Public Meeting Two………………………………………………………………………… 24
  Survey From Public Meeting Two……………………………………………………………………. 25
Appendix A………………………………………………………………………………………………… 41
Appendix B………………………………………………………………………………………………… 44
Appendix C…………………………………………………………………………………………………46
Appendix D………………………………………………………………………………………………… 49
Appendix E……………………………………………………………………………………………….. 53

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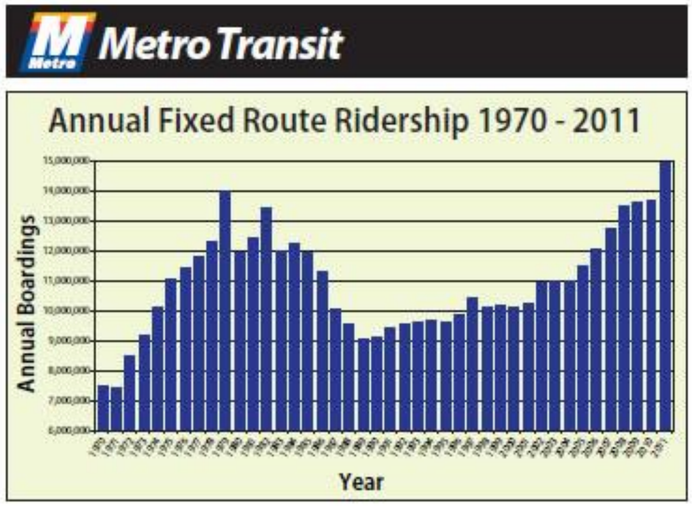
Project Description

Background

The Madison metropolitan area and Madison Metro ridership has grown substantially in recent years, placing pressure on the transportation system and prompting conversations about high-capacity transit solutions. Over the past 25 years, the greater Madison community has discussed the potential for rail, including high-speed rail, commuter rail, and a streetcar system. Through the course of these studies, bus rapid transit (BRT) solutions have been considered, but never analyzed in great depth.

The Madison area's transit system, Metro Transit, has seen significant increases in ridership starting in 2003. With these increases in ridership, Metro has experienced overcrowding, particularly on the lines that serve UW Madison and Madison College, often resulting in the need to add additional buses. For example, Metro buses' seating capacity is 38. A crowded bus is generally defined as having 15 to 20 riders standing. Bus routes that routinely were considered overcrowded had an average passenger count of 65. In some instances, ridership reached upwards of 70 passengers or more.



While a positive sign that the community is availing itself of the transit system, the overcrowding and associated operational issues negatively impact customer satisfaction. The overcrowding, in particular, is a strong indication that Madison is in need of improved service as well as the development of transit alternatives, such as BRT.

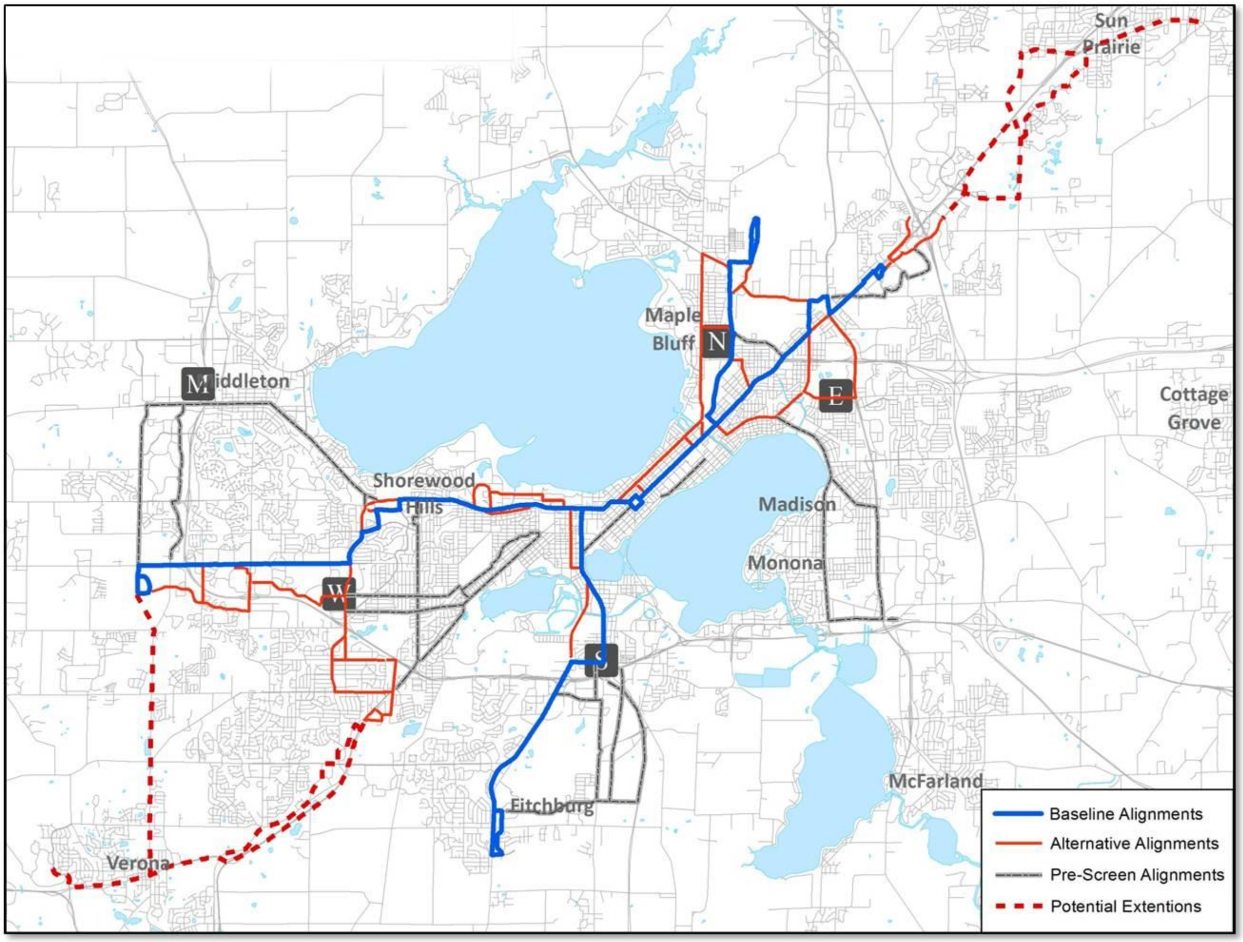
In 2012, Madison Metro was awarded the National Outstanding Public Transportation System Award, which is sponsored by the America Public Transportation Association (APTA). Called the "best of the best" in the industry, APTA recognizes its winners as outstanding role models of excellence, leadership, and innovation whose accomplishments have *greatly* advanced public transportation.

Study Overview

The purpose of the Transit Corridor Study is to develop and evaluate system-level and corridor-level concept plans for BRT along four of Madison's primary transit corridors**.** The BRT routes proposed for analysis in this study will operate in some of the strongest transit corridors in the region. Implementing a BRT system is less expensive and has a shorter timeline than other transit systems improvements such as commuter and light rail. BRT has similar positive impacts, including reduced vehicle miles traveled, increased non-automobile mode share, increased affordable housing, increased density and transit oriented development, and better connections between environmental justice areas to employment and activity centers.

Implementing a BRT system does not preclude the implementation of a rail system in the future. In fact, a well-developed BRT system may lay the groundwork for future rail development by building the transit market and encouraging transit-supportive development patterns.

The Madison Area Transportation Planning Board (an MPO) staff has identified preliminary BRT routes, alternative routing, and potential future BRT extensions (see map below). In concert with the Oversight Committee and through the public process, the consultant team will identify the routes and station locations that will: a) best meet the transit needs of the community, b) complement existing and future transit service and infrastructure, and c) have a positive impact on the physical and economic growth of the Madison area.



The BRT study is part of the Capitol Region Sustainable Communities Initiative with funding provided by a Sustainable Communities Regional Planning Grant (SRPG) by the U.S. Department of Housing and Urban Development.

The SRPG is funding a variety of activities, including the preparation of plans for enhanced transit and transit oriented development, under the leadership of the Capitol Region Sustainable Communities (CRSC) partnership. Led by the Capital Area Regional Planning Commission (CARPC), the CRSC partnership is a collaboration of public and private sector leaders and community members in Wisconsin's Capitol Region that is working together to maintain and improve the region's strength in economic opportunity, excellent natural resources, and quality of life.

Goal of the Public Involvement Process

The goal of the public participation strategy will be to engage the community in order to educate them on BRT and the positive impact it can have on city-wide and regional goals for mobility, sustainability, economic development, and environmental justice. The public involvement process will provide the community with the opportunity to give input on the recommendations of the technical study, thereby, creating confidence in those recommendations for both the public and the policy makers. The engagement of the community in the planning process will lay the groundwork for the strong community support that will be needed if a BRT system should be implemented in the future.

Challenges, Opportunities, & Solutions

The Transit Corridor (BRT) Study will need to educate the Madison community about BRT systems and their benefits to the healthy growth and development of an urban area. The study will need to determine if it can adequately serve the major employment, population centers, and transit dependent residents of the Madison area. Finally, once the study is complete, the major challenge will be securing the necessary funding to build and implement the system.

The proposed routes for the BRT system create the opportunity to facilitate and support some important areas of growth and development, existing and future.

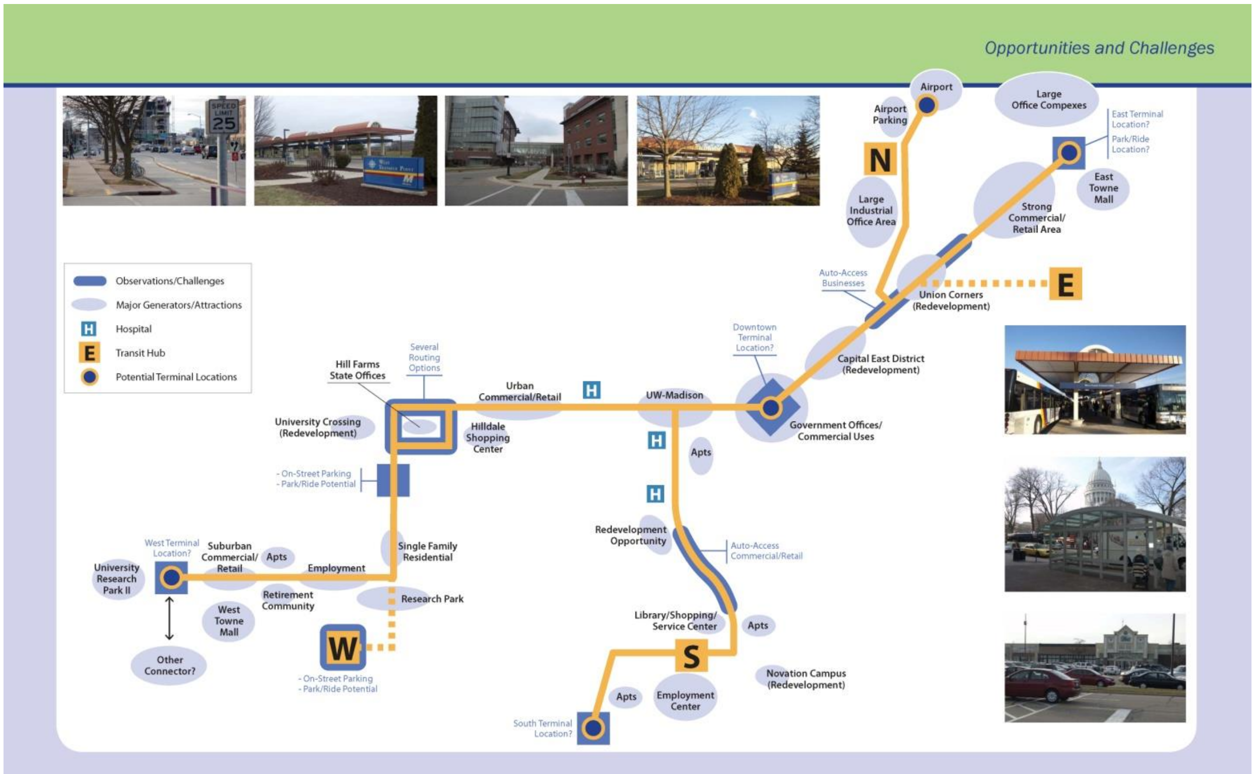
Existing

- Downtown Madison
- UW Campus
- University Avenue
- West Towne Mall
- East Towne Mall
- Isthmus
- Madison College
- Dane County Regional Airport
- Hospitals' Environs
- South Madison

Future

- Capitol East District
- Fitchburg Technology Campus
- Union Corners
- University Crossing
- University Research Park II
- North Madison

The aforementioned areas are illustrated in the diagram shown below. The proposed BRT routes will provide better connections between residential areas, employment areas, and shopping districts, particularly when considering connections from other local transit routes and potential BRT extensions.



The potential to support existing development and to facilitate new development efforts in places like the Capitol East District (see rendering below), will be an important part of the BRT route alternatives analysis as well as the station location analysis. Each of the routes and station locations will be analyzed to determine what impact the BRT might have on future development patterns, particularly the ability to increase density in low density areas, like strip malls and regional malls. This analysis will need to be done within the context of the new zoning code and existing neighborhood or district plans. Through a network of connections, a BRT system combined with other transit options like an express bus system could connect the broader region, beyond Madison, through transit

URBAN TECHNOLOGY CAMPUS - METRO
Central Park
Transit Stop
Park Oriented Tech/Office Sites
Research Products
Enterprise Center
Applied Education or Corporate Site
Wilson Street
East Main Street Extended
East Main Street
South Baldwin Street
South Dickinson Street
East Washington Avenue
Tech/Light Manufacturing Center
Phase 1
Washington Square
Enhanced Baldwin Overpass & Gateway
University of Wisconsin Metro Innovation Center
- Dynamic Industrial Rehab Centerpiece
- Tech/Office Space
- Creative Trades
- Brew Pub
copyright James Faecke, LLC. 2010
Design Concept: Vandewalle & Associates Inc.
Illustration: James Faecke
Madison
CAPITOL EAST District

Engaging the Greater Madison Community

Encouraging participation will require the dissemination of information through multiple outlets. Although the Transit Corridor Study is positioned as a technical study, having community members involved throughout project development will be important. While Madison is most definitely an engaged community with residents, businesses, and other stakeholders always willing to offer an opinion, it is sometimes difficult to get the community engaged within a particular planning process where and when it is necessary. The best way to encourage participation is to disseminate information through multiple outlets, as outlined in the section on Public Involvement Techniques.

The proposed routes run through or touch nearly forty neighborhood associations and many of the area business associations in the City of Madison and provide connections to major employers and employment centers. Metro's existing transit routes further provide connections to environmental justice areas and transit dependent populations. The goal of the public participation strategy will be to engage all of these stakeholders in order to educate them on BRT as well as on city-wide and regional goals for mobility, sustainability, economic development, and environmental justice. Stakeholders will be provided the opportunity to respond to the study recommendations on routes, station locations, and development opportunities. Meeting invitations and project updates can be disseminated via these neighborhood and business association listservs and member lists, district alder and county board supervisor emails, a project webpage, through CRSC meetings, events, website, and blog, as well as by members of the Oversight Committee.

The news media will be kept abreast of the project through press releases and will be encouraged to provide news coverage at key points in the process to educate the community about BRT and what it means for Madison. Community members will have a variety of opportunities to provide input through focus groups, public meetings, and the MPO's website. The format of public meetings will be designed to allow different types of input and feedback.

BRT Transit Corridor Study Public Participation Timeline

June
- Project Oversight Committee

August
- Project Oversight Committee Check in

September
- Focus Groups
- Project Oversight Committee
- Public Meeting

November
- Project Oversight Committee Meeting

February
- Draft Report
- Public Meeting

The BRT Transit Corridor Study will carry forward with the following major tasks:

Establish and Analyze Routing Alternatives – The consultant team will work with the Project Oversight Committee to develop a recommended set of screening criteria and factors to measure the suitability of the various alignment and termini alternatives, which may include current and projected population and employment density, transit demand, roadway "pinch points," the general ability of roadway segments to accommodate BRT, and changes to the existing transit system to complement BRT.

Identify Passenger Facility and Fleet Needs – After conceptual visualizations are developed using three-dimensional computer modeling to produce three alternative aesthetic designs for a typical station, the Project Oversight Committee will select a preferred aesthetic alternative for further refinement.

Evaluate Enhancements to the Roadway Network – The consultant team will identify and evaluate the impact of potential modifications to the roadway network to accommodate the BRT service options. Potential modifications might include bus-only or bus/bike/right turn lanes, parking restrictions, intersection queue jumpers and curb extensions at station locations. Impacts of potential modifications will be gauged on mixed traffic operations, bicycle users, transit operations, pedestrians, and property owners.

Transit Signal Priority – The consultant team will assess the level of compatibility between current traffic signal equipment and transit signal priority (TSP) to identify the requirements and potential benefits of implementing TSP for BRT service options.

Commuter Service – In addition to development of BRT service options the consultant team will identify options to expand local transit services to better serve outlying populations through commuter express services.

Documentation – The consultant team will thoroughly document stakeholder input along with the development and analysis of options throughout the project using a variety of tools including technical memoranda, briefings and a final report.

Related Planning Efforts

Engaging the Greater Madison community in the Transit Corridor Study public involvement process will create linkages between the community and forthcoming planning efforts like the City of Madison Comprehensive Transportation Master Plan. The City has identified a need for a comprehensive transportation master plan that integrates all modes of passenger and freight transportation (i.e. air, auto, bicycle, freight rail and truck, high-capacity transit, pedestrian, public transportation, etc.), identifies how those modes interconnect, and highlights how the City’s numerous plans and policies enhance and support the master plan. Essentially, the BRT Transit Corridor Study will inform the Comprehensive Transportation Master Plan.

Additionally, the Transit Corridor Study will link to the South Capitol TOD Master Plan, being prepared through the City of Madison. Currently, the district lacks the requisite transit-oriented elements. The TOD Master Plan will re-establish these elements in the district and integrate them with the rest of the downtown, creating a long-term vision for the district. The TOD planning district is anticipated to become the transportation gateway to Madison. Its location and configuration are critical in establishing the success of redevelopment in the downtown. Transit accommodations are an integral part of making the district the transportation gateway to Madison. Consideration will be given in the TOD Master Plan to higher capacity transit, including bus rapid transit (BRT), improved station areas, and an inter-city bus transfer point. As such, transit improvements and linkages relating to BRT will enhance the work of the South Capitol TOD Master Plan.

Goals, Objectives, and Expected Outcomes

While the Transit Corridor Study is primarily a technical study, a thoughtful public involvement strategy will be key to helping to ensure a successful outcome to the project and, most importantly, will help facilitate the future implementation of the BRT system. Madison is known for being a very engaged community. The health of a project depends on the connections established between professional recommendations and adequate community involvement. The public involvement process will be flexible in order to respond to community reaction.

Goals and Objectives of the Public Involvement Process

1. Educate the community about Madison Metro Transit's challenges, including overcrowding, operations, and rising costs, as well as its success in the face of these challenges.

2. Educate the community about BRT – what it is, how it works, and the benefits for residents, employers, current transit users, and the community as a whole in terms of sustainable development, economic development, and quality of life.

3. Seek input from the community in response to the study recommendations for the BRT system in terms of functionality, design, routes, and operations.

4. Lay the groundwork for the strong community support that will be necessary for the implementation of the BRT system.

5. Educate the community about the connection between land use and transit.

6. Ensure the community has confidence in the technical analysis by adequately explaining the process and the outcomes of the analysis.

7. Help the community understand that improved transit service will also improve other modes of travel.

The desired outcome for the public involvement process is to receive useful input and give the public and the policymakers confidence in the report.

Stakeholders, Participants, and Audiences

Public Agencies

City and County staff and leadership play an integral role in the Transit Corridor Study, and will be engaged through Oversight Committee meetings, City and County commission meetings, the workshop, public meetings, and the project website. City and County stakeholders include the following:

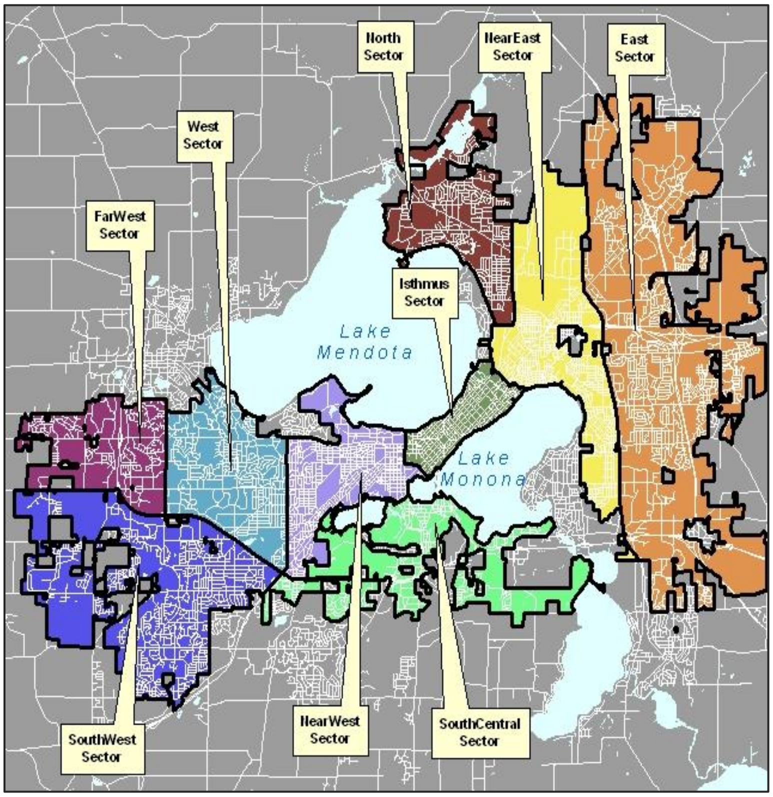
- Department of Transportation
- Madison Mayor's Office
- Madison Common Council
- Madison Planning Division
- Madison Economic Development Division
- Madison Engineering Department
- Madison Traffic Engineering Division
- Madison Long Range Transportation Planning Committee
- Madison Transit and Parking Commission (TPC)
- Contracted Service Oversight Subcommittee of the TPC
- ADA Transit Subcommittee to the TPC

- City of Middleton
- City of Fitchburg
- Dane County Executive's Office
- Dane County Supervisors
- Dane County Planning and Development Department
- Dane County Economic Development Committee
- Dane County Public Works & Transportation Committee
- Dane County Specialized Transportation Commission

General Public

Neighborhoods representing residents and stakeholders surrounding the proposed BRT routes will bring a critical perspective to study recommendations. The BRT system will traverse all of the sectors of Madison. Residents and stakeholders will be actively engaged in the process through focus groups, email blasts, public meetings, and the project webpage as well as through the CRSC partnership events and communication tools.

Madison is home to over 120 neighborhood associations, many of which will be touched by the BRT system. As the study progresses, cross-referencing the proposed route map with the City of Madison Neighborhood Sectors map[1] (see image below) will ensure that all neighborhood associations are informed about the Transit Corridor Study.



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[1] **City of Madison Neighborhood Sectors: http://www.cityofmadison.com/neighborhoods/profile/sectors.html**

Possible Madison neighborhood associations to contact for the public involvement process include:

- Capitol Neighborhoods
- Capitol View Heights
- Carpenter-Ridgeway
- Eken Park
- Hill Farms
- Marquette
- Midvale Heights
- Greenbush
- Vilas
- Sherman
- Tenney Lapham
- Sunset Village

A number of Fitchburg neighborhood associations are also in close proximity a proposed route:

- East Fitchburg
- Northeast Fitchburg
- Swan Creek of Nine Springs

In addition to the neighborhood associations, the planning councils can provide a vehicle for sharing information and engaging the community.

- South Metropolitan Planning Council
- Northside Planning Council
- East Isthmus Planning Council

Business Community Leaders

Major employers and institutions will provide key insights into market potential, route usage, and other components of the BRT system. These stakeholders will be engaged through the focus groups, email blasts, public meetings, and the project website**.**

- Edgewood College
- Madison College
- Meriter Health Services
- Saint Mary’s Hospital
- UW Hospital and Clinics
- UW Madison
- Downtown Madison
- East Towne Mall
- West Towne Mall
- Dane County Airport

Similar to the planning councils, business associations can provide a vehicle for sharing information and engaging the Greater Madison community. A sampling of the area business associations includes:

- African American Black Business Association
- Downtown Madison, Inc.
- Eastside Business Association
- Greater Madison Chamber of Commerce
- Greater Williamson Area Business Association
- Madison Latino Chamber of Commerce
- Northside Business Association
- South Metropolitan Business Association

Students

The student population in the Greater Madison community is responsible for creating a sense of daytime vibrancy that attracts people to the region. They also comprise some of the regular ridership of the current Metro bus system. Gathering input from these stakeholders will ensure that the BRT system promotes key pathways and access points that support continued vibrancy in Greater Madison. Students will be engaged through the email blasts, public meetings, and the project website. In particular, communications will target the Associated Students of Madison and UW Transportation Services.

Transit Riders

The general transit community in greater Madison has a vested interest in the outcomes of the BRT Transit Corridor Study. Metro transit users, rail advocates, and cyclists will be engaged primarily through the public meetings, but will also be engaged in the focus groups, email blasts, and the project webpage.

Matrix of Stakeholders and Public Involvement Techniques

	OC	*Wkshp*	*C/C Meetings*	*eBlast*	*Focus Groups*	*Public Meetings*	*Web*
Public Agencies	X	X	X			X	X
General Public				X	X	X	X
Business Community Leaders				X	X	X	X
Students				X		X	X
Transit Riders				X	X		X

Public Involvement Techniques

This PIP proposes the following public involvement techniques for the project:

Oversight Committee – Information Gathering and Consulting

The purpose of the Oversight Committee is to guide and inform the project process, provide technical, and policy expertise, and educate other policy makers about BRT and its potential benefits for the greater Madison community. Membership on the committee is comprised of representatives from CARPC, City, County, and MPO staff and commissions which have jurisdiction over transportation and transit matters.

Committee Meeting 1: The consultant team will present a project overview, review the Public Involvement Plan, seek committee input, and review the transit corridors.

Committee Meeting 2: The consultant team will present the results of the focus groups, the results of the first public meeting, the universe of alternatives, fleet options, and commuter service analysis.

Committee Meeting 3: The consultant team will present the routing alternatives recommendations, facility and fleet recommendations, roadway network typical sections, and signal priority recommendations.

Committee Meeting 4: The consultant team will present the draft report for review and discussion.

Workshop – Information Gathering and Developing Recommendations

The workshop will be divided into two parts. The first part will include policymakers, key stakeholders, and technical staff, and will provide the opportunity for participants to learn more about BRT, the screening process, and station features. The second part of the work session, which will include technical staff only, will focus on analyzing and discussing the BRT components including terminals, corridor segments, and potential routes. Agendas for the work session are located to the right, and below.

Part I
Combined Session of
Policy-makers and Technical Staff

- SRF team presents introduction to BRT and best practices from peer cities
- SRF team presents initial BRT corridor screening results and express bus route concepts
- Attendees participate in an interactive game activity to develop station feature and amenity concepts

One of the key outputs of the technical staff workshop will be a working definition of the various system-wide components—related to both service and physical characteristics—for each BRT level of investment.

City / County Commission Meetings – Information Gathering and Consulting

Presentations will be provided to various City and County committees, commissions, and boards on an ad-hoc basis throughout the study. The purpose of the presentations will be to focus on specific issues of particular interest to the selected committees, commissions, and boards in order to gather their input, update them on the project progress, and seek their input on the recommendations.

eBlast Announcements – Education and Communications

The eBlast project announcements will be distributed via neighborhood and business association listings, CRSC newsletter and website, district alder and county board supervisor emails, the project website, members of the Project Oversight Committee, the media, and the MPO's list of interested parties. The eBlasts will be employed to educate the community about BRT in general, the study process, and invite them to the public meetings.

Part II
Intensive Session with
Technical Staff

- Development of system-wide BRT components
- Discussion of downtown terminals and operation in shared corridor segment between UW and downtown
- Discussion of potential express bus route coordination with BRT system

Focus Groups – Information Gathering

The purpose of the focus groups is to gather information from key stakeholders regarding the needs, concerns, and opportunities for the BRT system. Early stakeholder input will be crucial for defining BRT concepts that can achieve broad buy-in. The stakeholder groups will be prioritized based on a stakeholder analysis and discussions with the Project Oversight Committee. Examples include the Chamber of Commerce, business associations and planning councils which exist along the proposed routes. The BRT Study focus groups will be coordinated with those for Market Study.

Public Meetings – Education and Information Gathering

Public meetings will be hosted in a "mixer-style" format, where the consultant team first provides a presentation before participants are invited to visit various stations that contain BRT information and interactive features. Input will be gathered at each station by a member of the consultant team or a project partner. Attendees may participate in an "amenity-mapping exercise" to highlight the nexus between amenities in Greater Madison and the proposed BRT routes. Appropriate venues will be selected to accommodate this format and enhance the participant experience.

The focus of the first public meeting will be to educate the community on BRT and its potential for the Madison area community. During the first public meeting, project partners will present background knowledge of BRT components to stakeholders, and point to benefits and shortcomings of BRT applications in other cities. The focus of the second public meeting will center on draft recommendations for the routes, station location, and station design. The consultant team will present the recommendations and will provide ample opportunity for meeting participants to ask questions and provide feedback through a question and answer session, exercises, and presentation stations.

Other Input/Outreach – Based on input from the Oversight Committee and community reaction to the project, it may be necessary to adjust or add to the public involvement strategy. The consultant team will directly engage MPO and CARPC staff as well as the Oversight Committee to determine how any alterations to the public involvement strategy can best meet the goals of the project.

Website – The MPO will establish and maintain a project webpage. The results of public participation events, the survey as well as project documents will be posted on the website as soon as they are available. Public comments on the project and process can be inputted through the website.

The PIP is designed to be a "living document." As the project proceeds, it will be revised and amended to reflect any adjustments to the strategy as well as the documented results from the various public involvement activities. Implementation of the PIP will be carefully scrutinized throughout the process to ensure the goals of the public involvement strategy are met, particularly the creation of community support for implementation of the BRT system.

Roles and Responsibilities

Task	Consultant Team	MPO/CARPC Staff
Project Oversight Committee	Prepare agenda and presentations, facilitate meetings, record comments, draft meeting minutes	Manage scheduling, secure meeting facilities and invitations, disseminate meeting agenda and minutes
Focus Groups	Assist in identifying focus group participants, draft invitations, assist with list of recipients, and prepare presentation, meeting boards, and meeting materials	Manage scheduling, secure meeting facilities, disseminate invitations, facilitate meetings, record comments, present to Oversight Committee
Public Input Meetings	Draft invitations, assist with list of recipients, prepare agenda and presentations, facilitate meetings and exercises, record comments, draft meeting minutes, present to Project Oversight Committee	Manage scheduling, secure meeting facilities, disseminate invitations and press releases
City/County Commission Meetings	Hold presentations, facilitate meetings, record comments	Select commission and committee meetings, manage scheduling
eBlast Announcements	Draft content, assist with list of recipients	Disseminate email
Website	Provide content	Develop and maintain website
Press Releases	Draft content in consultation with MPO and CARPC staff	Disseminate releases to local area print, radio, internet, and television media

Results from Public Involvement Activities

Results from Public Meeting One

Madison Transit Corridor Study – Results from Public Meeting Number One

Over 75 people attended the first Transit Corridor Study Public Meeting held on September 10, 2012. The two hour meeting included an introduction of Bus Rapid Transit (BRT) with a project presentation by Joe Kern of SRF Consulting, Inc. and additional presentations by Bill Schaefer, City of Madison (MPO), Chuck Kamp, Madison Metro, and Melissa Huggins, Urban Assets, LLC. A question and answer session followed the presentation during which meeting attendees were able to ask questions of the presenters. Meeting attendees were then encouraged to participate in several information gathering exercises.

Attendees were asked to sign in at the Welcome Table. The meeting agenda and additional materials on the project and project sponsors were available to participants. See Appendix A for the meeting agenda, and flyer that was sent via email to Madison Neighborhood Associations and posted on Metro buses to publicize the meeting.

Chuck Kamp from Madison Metro Presents on Metro's Recent Growth

Station Review and Community Input

Station One: Project Overview

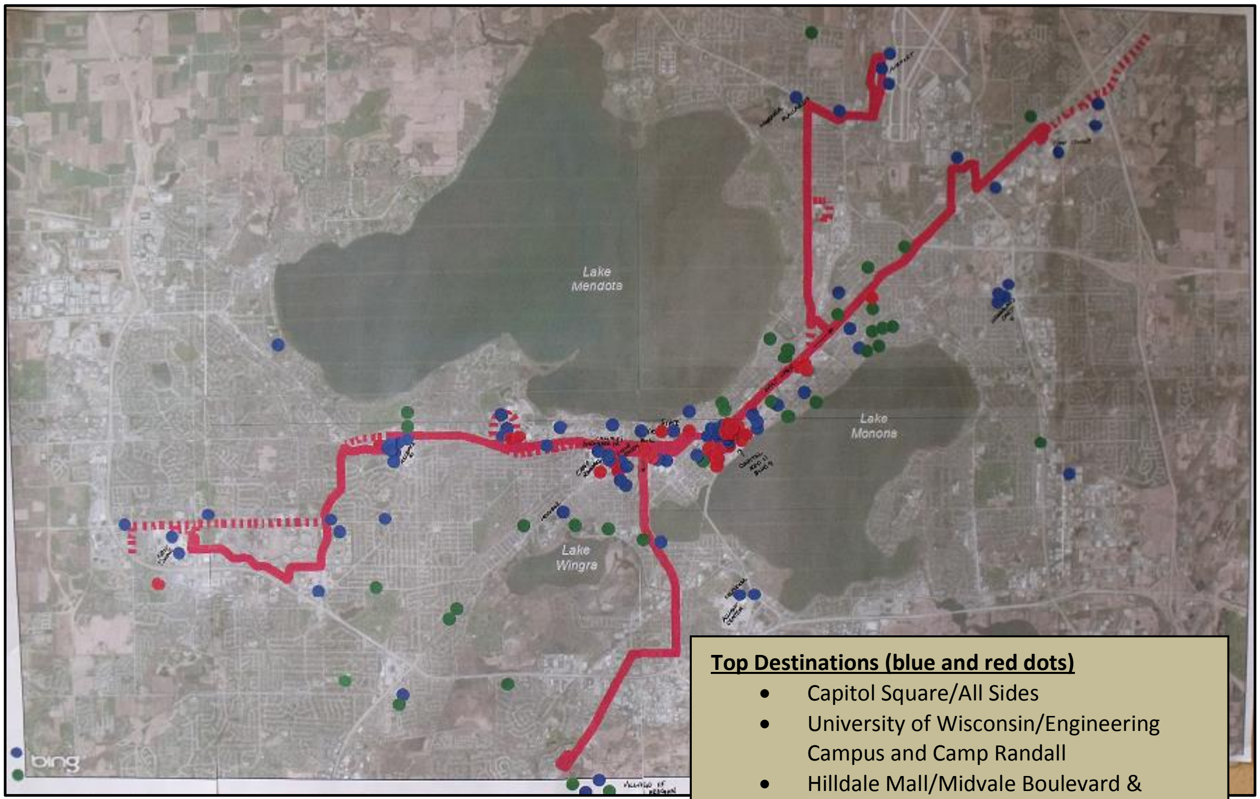
Project approach, working alignments, 2011 Metro Transit Ridership by Intersection, Metro system map and employment and housing density boards were placed on eight easels. The purpose of Station One was to educate participants about the project process and goals as well as the background information and analysis completed to date. SRF Consulting, Inc. and MPO, CRSC, and Metro staff were on hand to describe materials and answer questions.

Boards from Station One

Station Two: BRT Working Alignments

Exercise One – How might BRT change the way you travel throughout the Madison area?

North, South, East and West Corridor maps of the Madison area, noting initial BRT routes, were provided on large tables. Participants were given four colored dots (one green, one red, and two blue), and were asked to place the green dot at their residence, the red dot at their workplace, and the *blue dots on two of their top destinations.* The purpose of the exercise was to encourage participants to explore how the proposed BRT routes might enhance their transportation alternatives.



Top Destinations (blue and red dots)

- Capitol Square/All Sides
- University of Wisconsin/Engineering Campus and Camp Randall
- Hilldale Mall/Midvale Boulevard & University Ave
- Woodman's East/East Transfer Point
- University Hospital

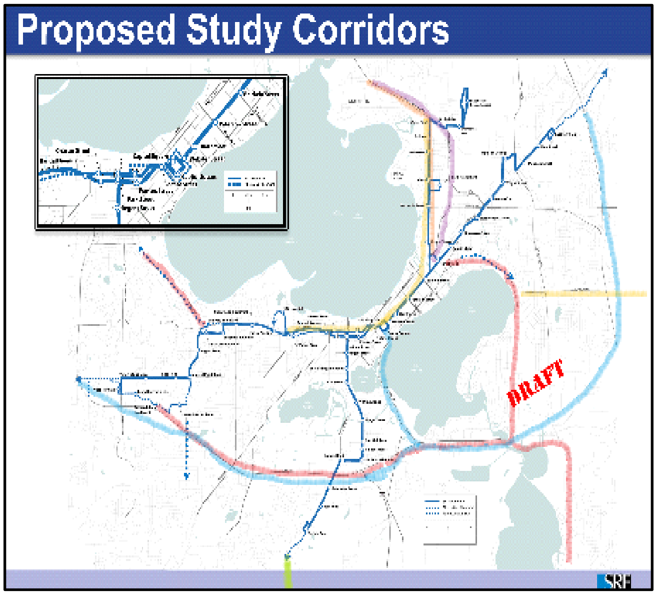
Responses Condensed onto One Map

Attendees Place Dots on Corridor Maps in Exercise Two

Exercise Two – Are there alternative routes that should be considered?

Participants were given an 8X11 Initial/Proposed Study Corridors Map and asked to indicate their preferred alternative routes using a marker. The purpose of the exercise was to provide input on route alternatives that may not have been considered. The alternate routes are highlighted on the map to the right and include the following:

- University Ave.
- Middleton, Beltline Highway
- I 39/90, Fish Hatchery Road
- Fitchburg, John Nolen Dr., Monona Dr.
- USH 51, Cottage Grove Road, Packers Ave.
- Northport Dr.



Responses Condensed onto One Map

Exercise Three – What other screening criteria should be considered?[2]

Participants were encouraged to write additional screening criteria they felt should be considered in determining the BRT routes on a flip chart. The original screening criteria employed by the consultant team included the following:

- Employment within one-quarter mile
- Existing transit ridership along the route
- Population within one-quarter mile
- Development potential
- Roadway suitability

The following list summarizes the suggested screening criteria. A complete list is located in Appendix B.

- Low travel times
- Simple service design
- Impact to other transit service
- Bicycle Connections
- Parking demand reductions
- Congestion mitigation
- Public health/air quality

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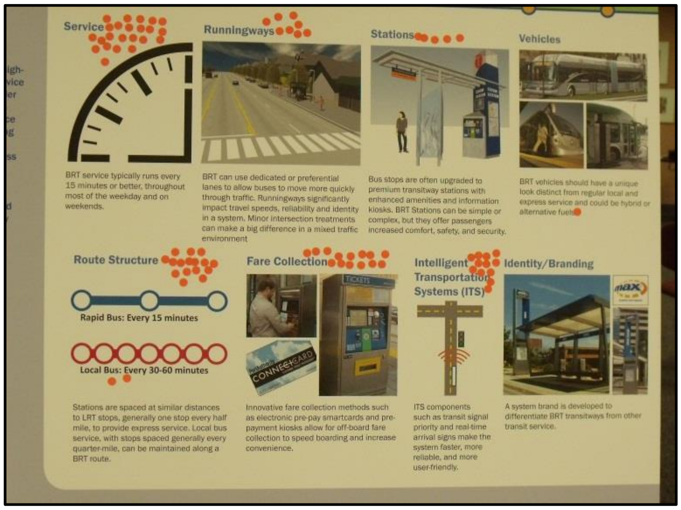
[2] A number of attendees participated in this exercise more than once.

Station Three: BRT Components and Amenities

Exercise Four - Which components and amenities do you think are most important for a successful BRT system for Madison?

Pictures and descriptions of BRT components and amenities were placed on two easels (including corridor BRT versus fixed guide way). Participants were asked to place orange dots (three) on their top priorities with the note that they could all be used for one priority, if desired. The results are listed from highest to lowest.

- Service (23)
- Route Structure (18)
- Fare Collection (14)
- ITS (12)
- Running ways (8)
- Stations (5)
- Fast and Direct (3)*[3]
- Vehicles (1)
- Identity/Branding (0)



Service

BRT service typically runs every 15 minutes or better, throughout most of the weekday and on weekends.

Runningways

BRT can use dedicated or preferential lanes to allow buses to move more quickly through traffic. Runningways significantly impact travel speeds, reliability and identity in a system. Minor intersection treatments can make a big difference in a mixed traffic environment

Stations

Bus stops are often upgraded to premium transitway stations with enhanced amenities and information kiosks. BRT Stations can be simple or complex, but they offer passengers increased comfort, safety, and security.

Vehicles

BRT vehicles should have a unique look distinct from regular local and express service and could be hybrid or alternative fuels

Route Structure

Rapid Bus: Every 15 minutes

Local Bus: Every 30-60 minutes

Stations are spaced at similar distances to LRT stops, generally one stop every half mile, to provide express service. Local bus service, with stops spaced generally every quarter-mile, can be maintained along a BRT route.

Fare Collection

Innovative fare collection methods such as electronic pre-pay smartcards and pre-payment kiosks allow for off-board fare collection to speed boarding and increase convenience.

Intelligent Transportation Systems (ITS)

ITS components such as transit signal priority and real-time arrival signs make the system faster, more reliable, and more user-friendly.

Identity/Branding

A system brand is developed to differentiate BRT transitways from other transit service.

Preferred BRT Components and Amenities

Station Three Participants

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[3] This BRT component/amenity was added to the list by meeting attendees.

Station Four: Redevelopment Opportunities and Other Potential Impacts

Redevelopment potential sites and current/future express bus services were placed on two easels. The purpose of Station Four was to educate participants about the connection between transportation and land use as well as other transit options. Metro and CSRC staff were on hand to answer questions.

Station Four Boards

Additional Community Input

In addition to the exercises at stations two and three, 3X5 cards were available at each station, and at the entry table. Participants were asked to write down any comments, questions, concerns, or other feedback and place the card(s) in the basket on the entry table. The following includes a summary of some of the collected responses.[4] The complete list of responses is located in Appendix C.

- Future maps should show the entire metro area
- Middleton's employment areas seem not to be fully counted
- Impact on ADA Transition Plan should be another screening tool for routes a
- Expand NW on Northport instead of going to the Airport
- Do not sacrifice biking – roll bikes onto bus, will save time
- Feasibility should include sensitivity analysis with gas price as major independent variable
- BRT is less important than increasing number of places in the city with 30 minute or better service
- Consider extending west corridor past West Towne to include future developments in Research Park
- Consider additional corridors for West side which is geographically larger
- Add goals for parking demand reduction, health improvement, air pollution reduction and congestion mitigation
- Stations appear to be too close together - should be one third to one half mile apart
- Stations Include Park and Rides on the Beltline

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[4] A number of attendees participated in this exercise more than once.

- Take in to account people's everyday transportation needs: grocery stores, medical clinics, senior housing

Results from Public Meeting Two

Over 75 people attended the second Transit Corridor Study Public Meeting held on April 15, 2013. The two hour meeting and open house included a welcome and project overview by Bill Schaefer, Manager, Madison Area Transportation Planning Board, and comments by Madison Mayor Paul Soglin and Larry Palm, Chair of the Capital Area Regional Planning Commission. This was followed by a Bus Rapid Transit (BRT) Transit Corridor Study – Presentation of Findings by Joe Kern, SRF Consulting Group, Inc. A question and answer session followed the presentation during which meeting attendees were able to ask questions of the presenters. Meeting attendees were encouraged to look at the corridor boards on display and fill out the community survey.

Attendees were asked to sign in at the Welcome Table. The meeting agenda and Madison Area Bus Rapid Transit Study Flyer were available for attendees. See Appendix D for the meeting agenda, study flyer and the flyer that was sent to Madison Neighborhood Associations via email, and posted on Metro buses to publicize the public meeting.

Larry Palm, Chair of the Capital Area Regional Planning Commission

Joe Kern, of SRF Consulting Group, Inc. Presents the BRT Transit Corridor Study Findings

Survey from Public Meeting Two

The BRT online community survey was completed by 69 participants. Of those participants, the majority are in favor of supporting the implementation of a BRT system in Madison. According to survey results, 66% of participants are likely or very likely to use a BRT system, while 78% are in favor of proceeding with the next steps toward the eventual implementation of a BRT system.

Of the five corridors—Central, West, South, East, North—the majority of respondents, 64%, say they would use the West corridor most regularly followed by the East corridor at 40%. 70% of respondents felt the proposed frequency (time between buses) and span (hours of operation), were acceptable.

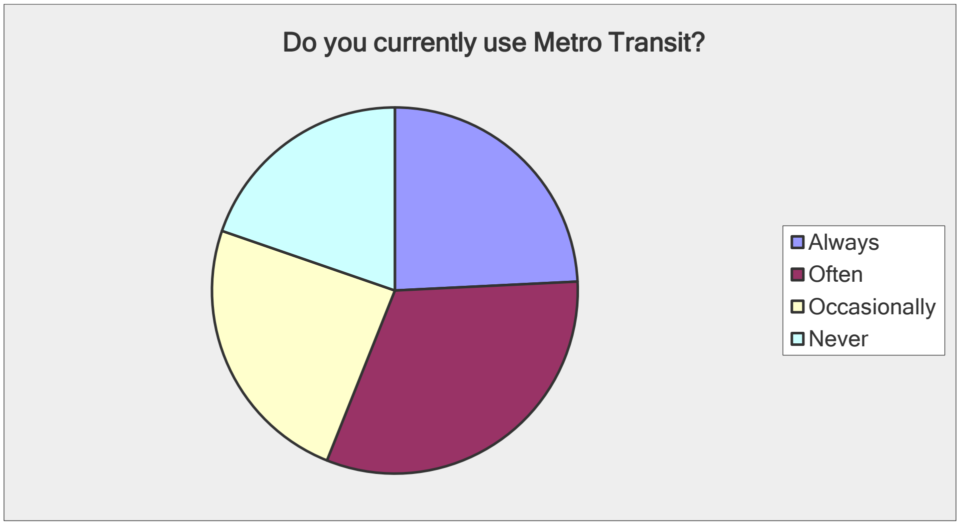
Bill Schaefer, Manager, Madison Area Transportation Planning Board and Chuck Kamp of Madison Metro Talk to Meeting Participants

The three most important elements of a BRT System for the respondents were faster service/fewer delays, frequent all day service, and direct routing. The four top elements for the BRT stations were safety, informational signage with regular updates, benches, and bike racks.

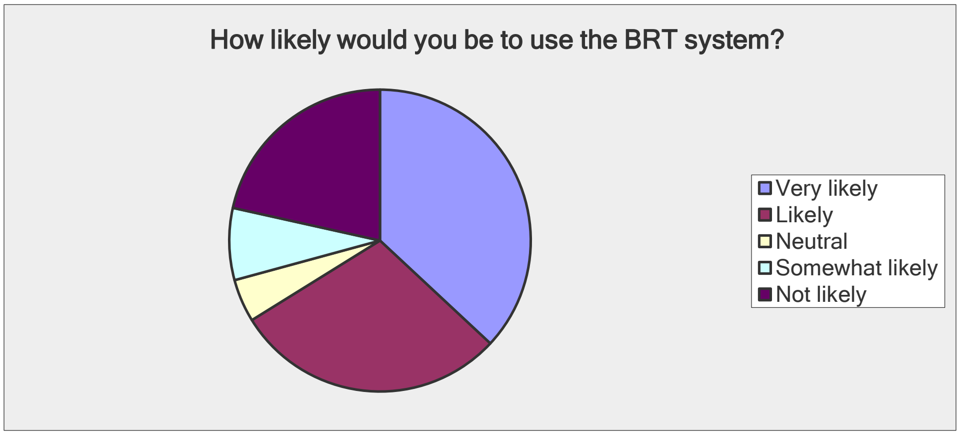
Below are the survey results and individual comments for each survey question. The survey's raw data is available in the Appendix E.

Meeting Attendees View Corridor Boards

Question 1



Question 2

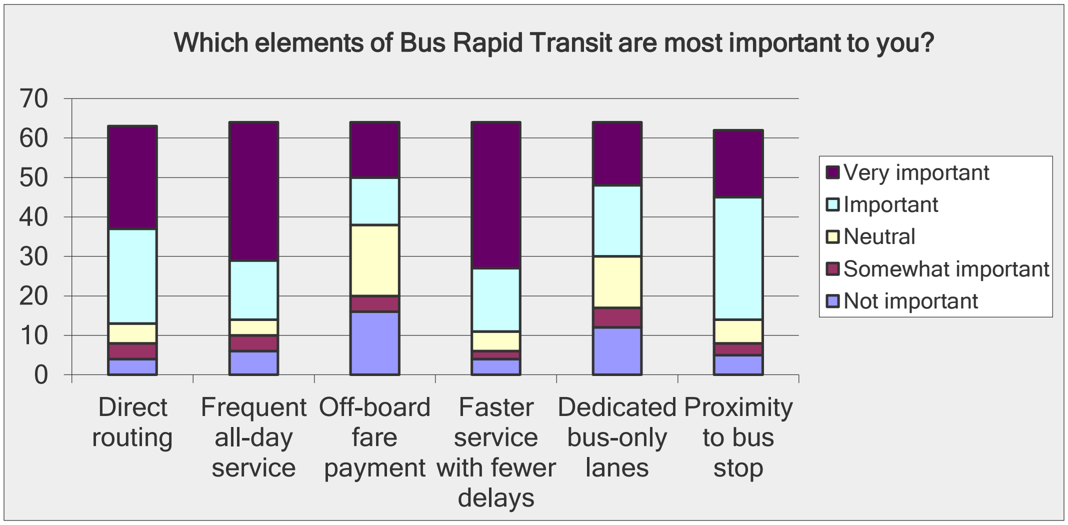


Question 2 Additional Comments

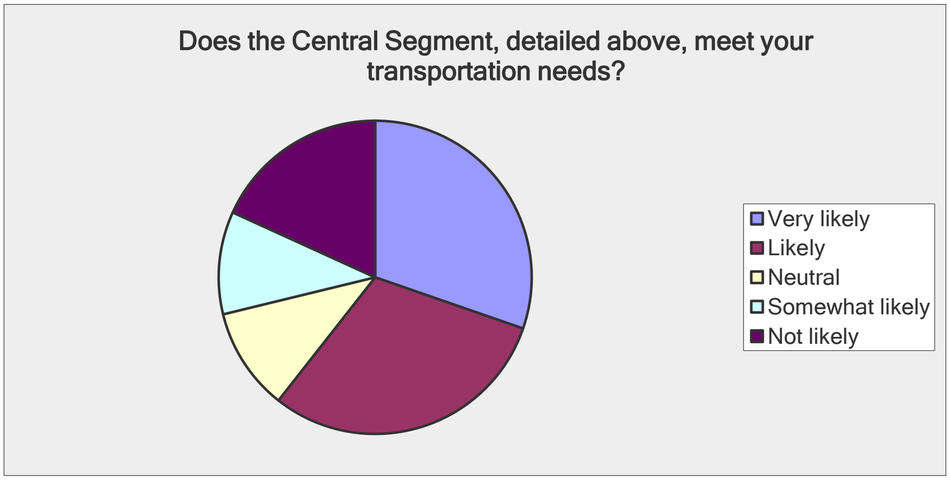
- Very exciting—hope this happens!
- Not near a BRT route.
- Given current proposal, most likely only occasional use (I'm on the Johnson/Gorham corridor).
- I live beyond reach of the system and am retired.
- Bicycle commuter 10-12 months/year
- Would use if I lived near it.

- Nowhere near my house.
- If there is a connecting bus to/from Melody and Independence to/from East Towne.
- There is not a bus stop close to my location.
- I pay too much in taxes for something we never use!!!
- I find it unfortunate that homeowners end up footing the bill all the time. These kind of taxes are making it impossible for middle- or lower-middle class people to own homes in Madison or Dane County.
- Depends on whether there would be a stop anywhere near my home.
- I frequently ride the bus from the Westmorland neighborhood to Middleton through the West Transfer point. The BRT would not serve my purposes, which is OK. But I am concerned if the BRT would adversely affect my Route 6 and Route 73 commute to Middleton. It's also difficult to reach Hilldale area which would be more difficult if the WTP is moved further west.

Question 3



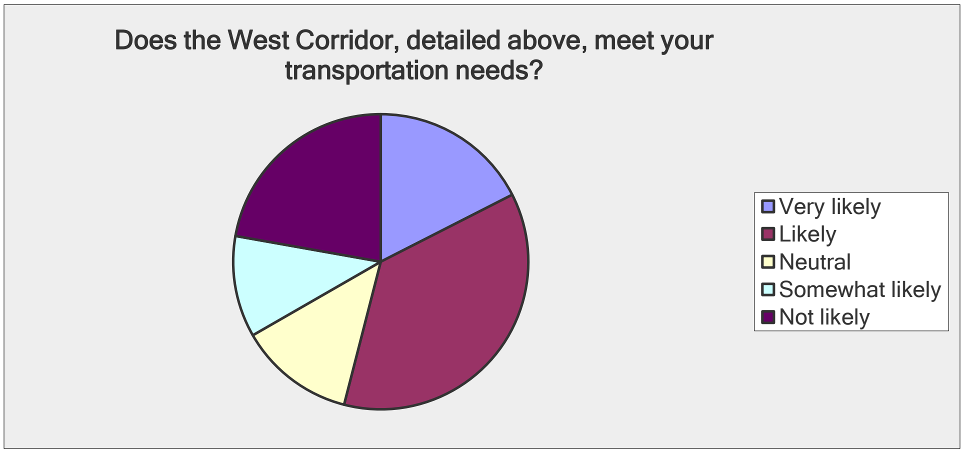
Question 4



Question 4 Additional Comments

- At this point in my life, I'm a full-time bicyclist. I do not use a car, so rides will take away my bike riding, not reducing pollution.
- Sometimes—usually at night. In morning, I'd take the Johnson/Gorham corridor buses.
- I usually go down University and Johnson, mid-campus and Willy St. to Atwood.
- Do not frequently go downtown.
- I would prefer electric overhead rail service-cleaner and quieter.
- Concerned about BRT use of State St. and Capitol Square. It will diminish the "rapid" part of BRT.
- Why always the inner square?
- I'm really more interested in getting to the bike shop.
- Don't need capitol service if it would be faster to avoid.
- Don't care, lower our taxes!!!
- State Street, MATC & the VA Hospital are important to me.
- Commute from further down E. Wash corridor
- Would need to be longer extended on either end.

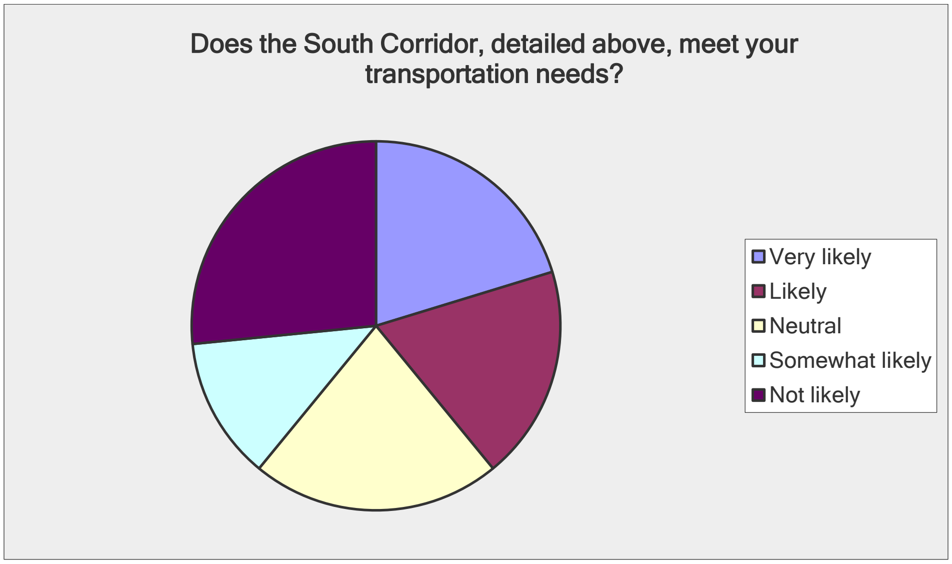
Question 5



Question 5 Additional Comments:

- I never go the Waste Side.
- Prefer Mineral Point (sic).
- Large portions of SW side underserved.
- Downtown and campus to West Towne is good for students.
- A stop on Segoe would be very helpful. Could become a "backdoor" entrance to Hilldale.
- I hope eventually to see an inter-city station.
- I'd like to see fixed guideway on University from Midvale to State St. If people see buses passing them, they will take the bus.
- Don't go West often.
- Prefer rail on University Ave. with bus shuttles.
- Verona
- Again, concerned about any BRT use of State St. and Capitol Square. Negative impact on "rapid."
- It would be nice if I could see the map better....very nice.
- Provided Odana variant reaches out to High Point as well.
- I would oppose side running (loss of on-street parking) on Whitney between Mineral Point and Regent.
- Is there planned service NW toward/into Middleton?
- DITTO
- I live in Westmorland area, so the BRT wouldn't serve me, but it's OK so long as a bus like Route 6 or 7 still goes through Westmorland.

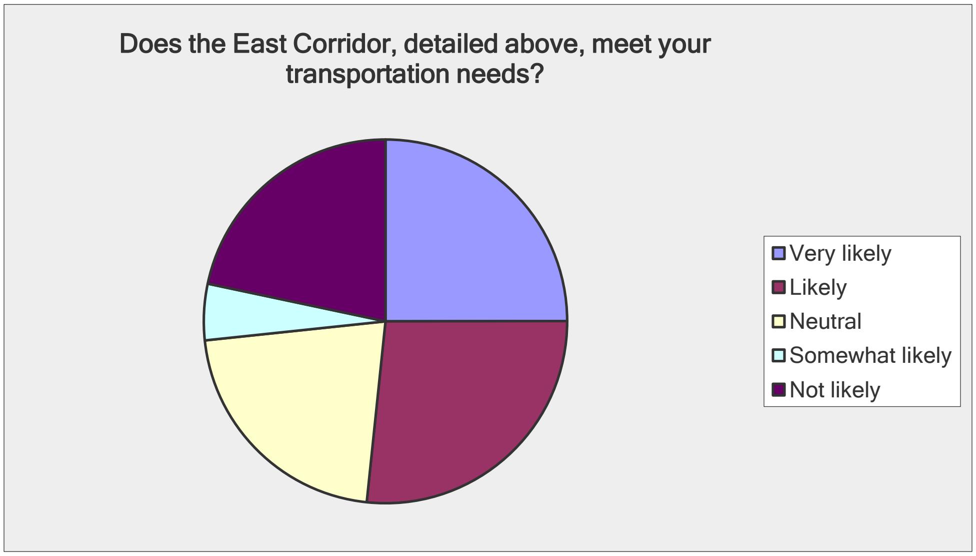
Question 6



Question 6 Additional Comments

- This is a corridor not well covered now by transit.
- Yes! Access to GHC South will get me on it.
- Rarely travel down Park Street.
- I rarely travel Park St. due to car congestion.
- Again, do not use State St. and Capitol Square.
- Prefer to touch Hwy Pd.
- How would this affect residential areas?
- This is the nicest line of all so far.
- Don't travel south.
- Extend for 1.3 mile and 1 station to Library, City Hall, Sr. Ctr.
- Seldom need to travel south.
- Yes! Service to Fitchburg is a must.
- Doesn't apply since I don't travel that way.

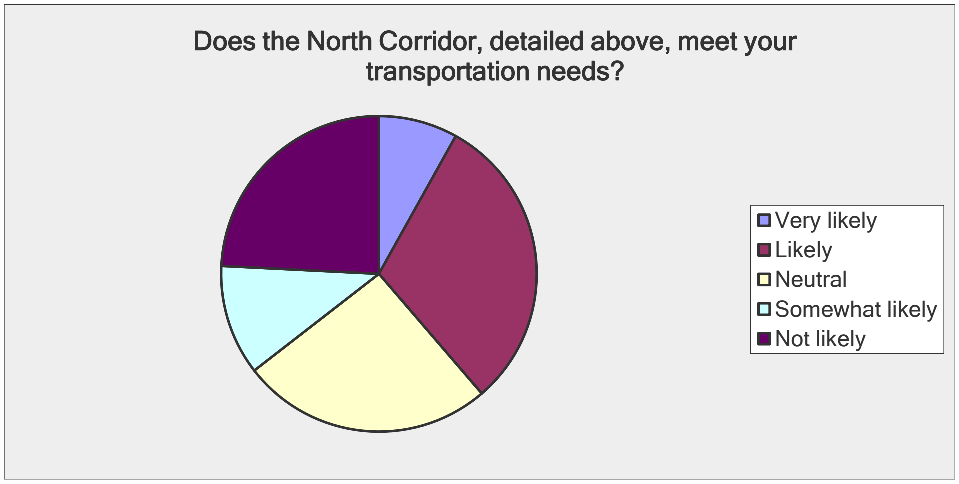
Question 7



Question 7 Additional Comments

- Please include bus shelters at Union Corners & East High stops.
- See above, though. I rarely take transit.
- Don't do the Wright St. loop.
- Campus and downtown to East Towne Mall and Madison College and airport would be best.
- Need fixed guideway on E. Washington. People need to see benefits of metro.
- Rail service is cleaner and quieter. Use busses as collectors between rail system and residential, commercial nodes.
- Stay off Capitol Square.
- Why wait till after the presentation to see larger maps…
- It would be nice to have easier access to the Airport.
- Would much prefer a stop at E. Wash and Stoughton.
- Take care of the crime at transfer points first.
- Doesn't apply since I don't travel that way.

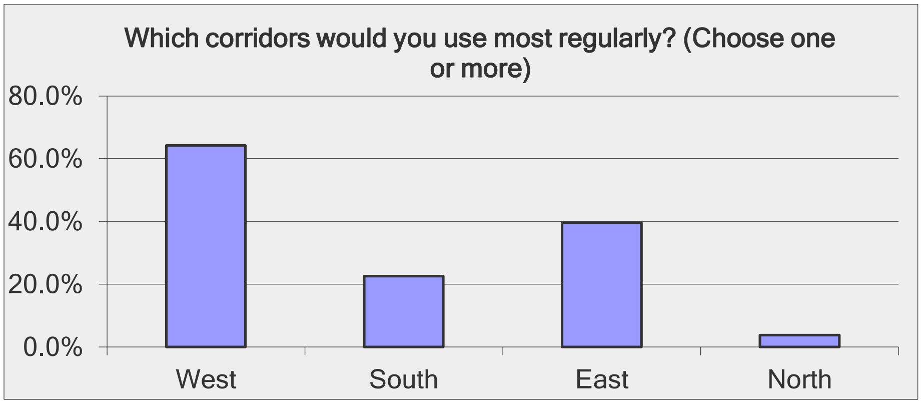
Question 8



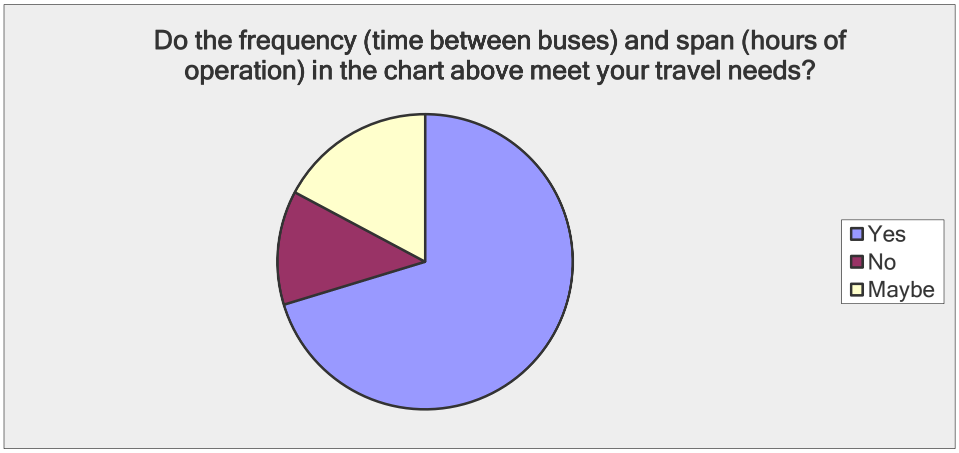
Question 8 Additional Comments

- Could the route come in closer to East High?
- Where I live and where I go (East side), this corridor wouldn't work for me.
- I like the service to the airport. Very important.
- The airport is a loser—look at taxi loading data and air travel data.
- Can't read map. Label better. Only go here for Mallards game or fireworks.
- The airport is important.
- 1. Partially likely with a smooth competition to the airport. 2. Also need direct connection to MATC.
- Wish it went to the airport that would encourage tourists to use it.
- Need to go to Packers and Scott and keep transference where it is.
- Prefer rail along E. Washington (or parallel to it in the existing corridor) with bus connection north from a rail stop/hub.
- Do not go on Capitol Square.
- Are you sure that's north?
- Would likely use only via airport.
- Take care of crime first.
- Doesn't apply since I don't travel that way.

Question 9



Question 10

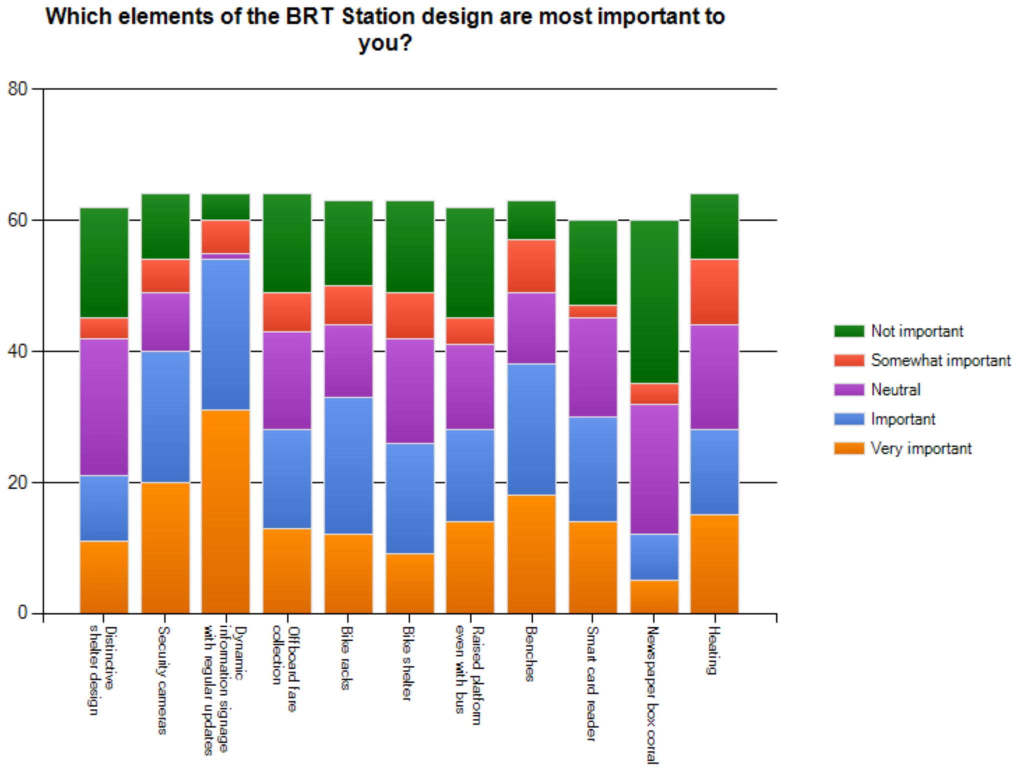


Question 10 Additional Comments

- Huge improvement over existing service?
- We need even more service, especially late at night (after midnight).
- You've got the hours for peak service wrong. Look at data from UW/Nelson Nygeard study.
- Needs to be extended. UW hospital shift work 11:00 pm. One shift starts and 11:30 another ends. More downtown service until about 2:30 am to reduce drunk driving.
- Even later on weekends would be great!
- Need to be long or m-stat at least.

- 5 am is too early for loud buses along University corridor residential zone. We are already inundated by noise from UW hospital and freight trains at crossings that should be upgraded to "horn free." I see very few bus riders past 11 pm and am not convinced a faster system will be better used.
- I grew up in Milwaukee where people don't keep a schedule (at least at that time). Go to the bus stop and wait within 10 minutes a bus will show up!
- Will there be holiday service? Would it be possible to extend weekend night hours to at least midnight?
- Would prefer transition to 15 min. until 7:00 p.m.
- Would prefer more frequent service Sunday midday, but it's no worse than metro at least.
- Peak and Midday service at 15 and 20 minute intervals also seem acceptable.
- Don't use, but pay for it!?
- Weekends need later evening busses
- Service should go later into the night, especially on weekends.
- Extend the PM peak to 630pm.
- Maybe extend pm peak to 7pm

Question 11

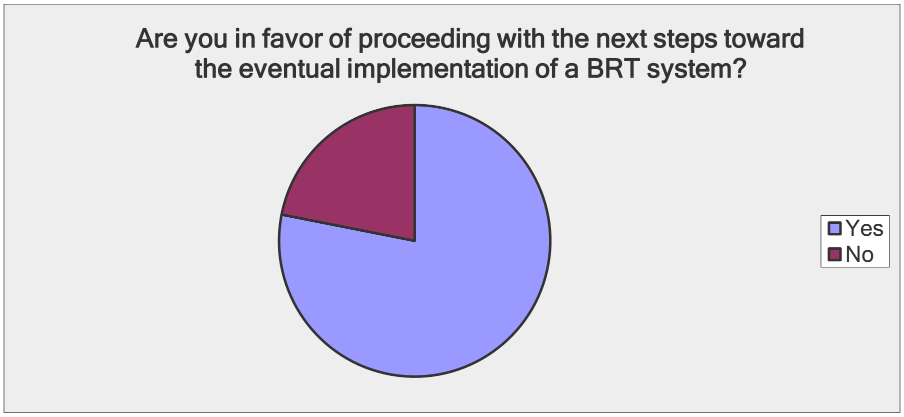

Which elements of the BRT Station design are most important to you?

Question 11 Additional Comments

- Good lighting at night.
- Don't choose bench material that is so cold/hot (metal). Choose wood?
- Ability to keep buses moving with commuter-jammed streets. How can you avoid buses being held up by moderate weather and crash-related traffic jams?
- Trash containers
- There needs to be enough lighting at night for safety and clarity. Bus stations need to accept cash as well as credit/debit. Beautify the bus stop areas by planting trees, shrubs, flowers.
- Is it safe to leave my bike there?
- Protection from wind as far to the ground as possible.
- Garbage cans, better lighting
- Benches should not allow patrons to lie down.
- Lower our taxes!
- Distinctive branding like calling the system the "M," Metro mover.

- We do NOT need a $1,000,000 bus stop like in Virginia. They should be simple and protect riders from the elements. They don't need wifi or bike shelters or heat. Just walls and a roof.
- Police Man?
- Bike racks are a good idea, but I doubt I would feel safe leaving my bike there.

Question 12



Question 13

Do you have any additional comments or input on the recommendations, planning process or next steps?

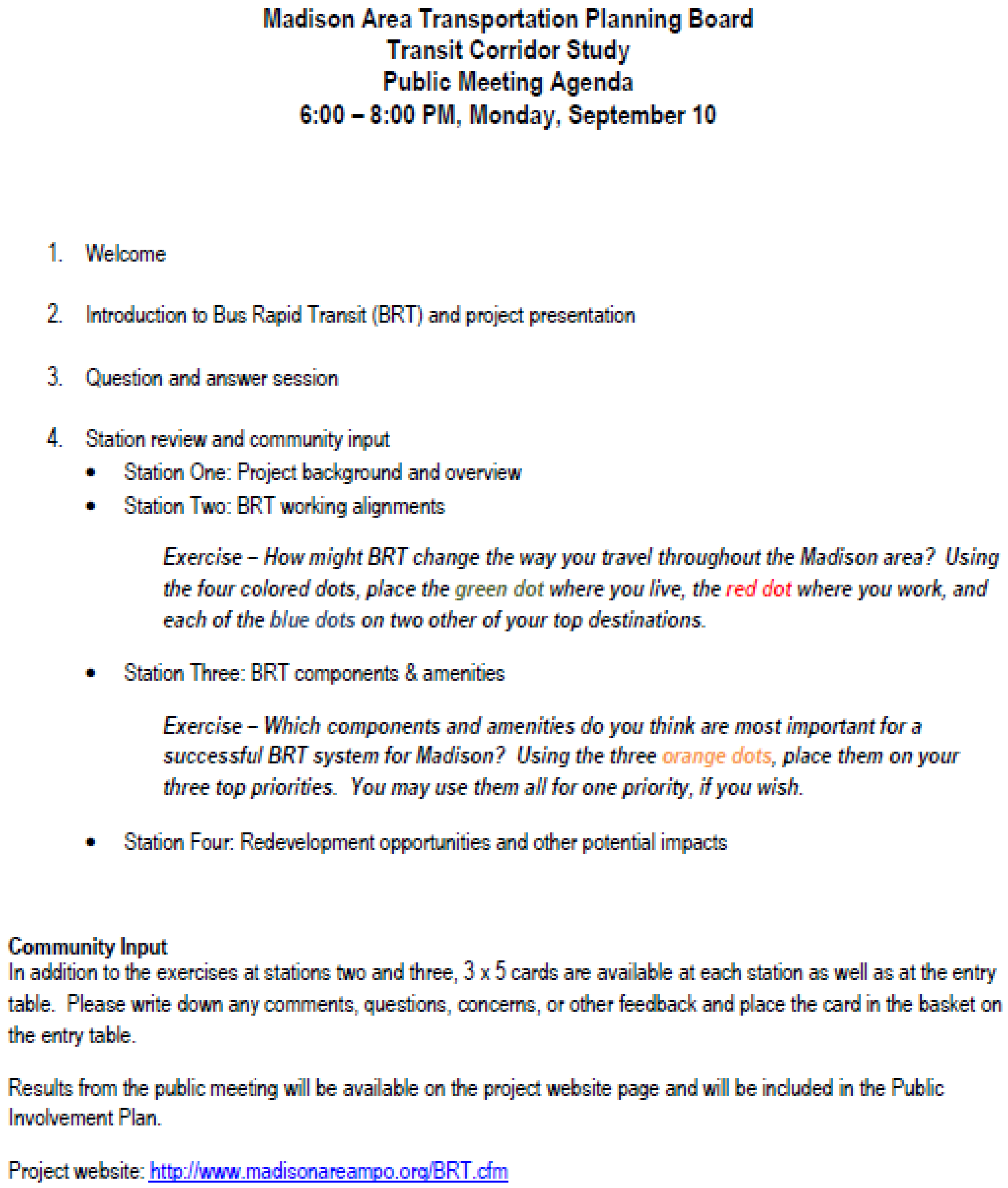
- BRT stops are great opportunities for neighborhood place making. Please consider making each one special within the overall BRT branding plan.
- This survey is confusing. Neutral usually means don't care either way, so having that third is out of sequence.
- Buses should be free. Shop subsidizing the car and motor vehicle system. It's important to make transfers very easy and seamless between BRT and regular Metro.
- Serve SW side of town. Ring road service.
- On the bus choose seating materials that can be easily cleaned and wiped down—fabric seats are disgusting...
- What about projecting farther routes to Middleton, Sun Prairie, etc.
- A great idea! Let's move ahead.

- Great branding for the City! Keep pushing Madison forward as a leader in all forms of alternative transportation. I do, however, wish there were more opportunities for dedicated bus lanes in this system. I think any/all opportunities to consider this when resurfacing/redesigning roads will greatly improve the system.
- I would like to see a plan to include inter-modal station/inter-city bus and on train service.
- Fixed guideways
- Yes, get implemented, thanks! Also, phone work with metro and Sun Prairie to get a connection as Sun Prairie has a significant population.
- I strongly believe a rail system from Sun Prairie to Middleton, with a radial system of bus service, is the only way to free our transit system from the tyranny of car-jammed roadways! What will be the air quality and the health impacts of running diesel buses through the University Ave/East Washington corridor? Using clear, electric rail is much healthier.
- Feeder lines S/B in line with BRT schedules
- Stay off State Street, use outer ring. Keep "rapid" in BRT.
- Possible system names: Flash Metro, Quick Bus, Speedy, Fast Ride. Will I be able to use my monthly pass to access the BRT system? Will I be able to buy monthly pass at the locations that currently offer them? Buses shouldn't be too cramped, shouldn't advertise on windows.
- Sometimes I think that the transit planners are from exotic places like Minnesota or Iowa. Just keep thinking about us poor people who have walked the streets of this town all our lives, we are getting tired....
- Do not cannibalize existing bus service. ADD to it only.
- Against using bike lane for bus on Whitney Way. Traffic does not back up in our neighborhood and there would be NO advantage to having a dedicated lane. Only an inconvenience for the residents and bikers in the area.
- Would prefer mixed traffic rather than side running or median lane on Whitney between Mineral Point and Regent.
- I am not in favor of the BRT because of the high cost and the fact that I will not be able to use it with any regularity.
- I am not in favor of higher taxes to pay for this system.
- The current system needs to be re-vamped so I am more inclined to take the bus. I live on the near east side close to the Great Dane and there is not a bus stop that I can use to get to work. If there was, it would still probably take about 45 minutes for me get to work.
- I only live about 3 miles away from work. The current system or any changes that will be made also need to take into account those who are living on the far edges of the city. Right now, it seems like the more populated areas are deemed more important.
- Please hold more public hearings.

- None these routes would help me and I DONT want to pay for it with tax money. You ride the bus you should be paying for it.
- Waste of money. Just bring another bus behind each other at busy points and times. Duh!
- Why must homeowners bear the brunt of the municipal services that basically benefit those who don't work or pay taxes? I pay almost $7000 annually for garbage service, snowplowing, and yard waste pick up, which I am now "encouraged" to mulch or bring in to a site. Soglin proposes to raise taxes to upgrade bus service so the unemployed can ride and continue to beat up other passengers? Madison is rife with idiots whose primary purpose is to be the voice of special groups while the majority working class PAY. This liberal socialist haven is driving out conservative, hardworking citizens and will soon have no middle class workers because they can no longer afford to foot the bill for entitlement programs.
- I am being taxed out by the federal government through entitlement programs and Obamacare. Now the city of Madison and the county of Dane are going to make it impossible for me to continue to live in the city I work in.
- Security, security, security
- Extend BRT to the outlying suburbs, like Verona, with a park and ride, so one can park the car and ride into the city, no need for a car downtown. Brand the system. Call it the "M," “metro mover,” for example. This could open up downtown to people that no longer will drive downtown. Use median or dedicated lanes so we really get RAPID transit.
- Please don't build this. We are taxed too much already. This cannot be afforded by the overtaxed residents of this County.
- This is way too much money for a system that will not have enough benefit. The only people who use it will just be people who ride the bus anyways. A much cheaper system that would actually help people is much more frequent normal buses during peak hours.
- Let the planning begin with local money from Madison and Fitchburg!
- Maybe more express buses, more extra buses on busy routes and a big PR campaign instead of BRT. Raise the price of parking downtown. Free bus rides for big downtown events.
- Would love to see this extend out to suburban communities. Sun Prairie to Madison, for example would be incredibly useful for commuter traffic.Traffic signal priority and exclusive ROW are the most important to me for establishing ridership... the fewer turns the better—route easier to follow and faster.
- Great ideal!!!
- I'm in favor of the BRT, only if it doesn't eliminate the Route 6, 7, and 73 buses which allow access from Westmorland neighborhood to Middleton. The nice thing about the West Transfer Point is it's more centrally located in the South West area of Madison. I realize there will be a need for a far west transfer point due to future growth, but right now, I hope it doesn't eliminate the current West Transfer Point.

Appendix

Appendix A



Madison Area Transportation Planning Board
Transit Corridor Study
Public Meeting Agenda
6:00 – 8:00 PM, Monday, September 10

1. Welcome

2. Introduction to Bus Rapid Transit (BRT) and project presentation

3. Question and answer session

4. Station review and community input
   - Station One: Project background and overview
   - Station Two: BRT working alignments

     Exercise – How might BRT change the way you travel throughout the Madison area? Using the four colored dots, place the green dot where you live, the red dot where you work, and each of the blue dots on two other of your top destinations.

   - Station Three: BRT components & amenities

     Exercise – Which components and amenities do you think are most important for a successful BRT system for Madison? Using the three orange dots, place them on your three top priorities. You may use them all for one priority, if you wish.

   - Station Four: Redevelopment opportunities and other potential impacts

Community Input
In addition to the exercises at stations two and three, 3 x 5 cards are available at each station as well as at the entry table. Please write down any comments, questions, concerns, or other feedback and place the card in the basket on the entry table.

Results from the public meeting will be available on the project website page and will be included in the Public Involvement Plan.

Project website: http://www.madisonareampo.org/BRT.cfm

Transit Corridor Study Public Meeting

6 to 8 PM, Monday, September 10th
Madison Senior Center, 330 West Mifflin Street

The Madison Area Transportation Planning Board (MPO), in cooperation with Metro Transit and the Capital Area Regional Planning Commission (CARPC), is leading a study to explore where and how to implement Bus RapidTransit (BRT) in the Madison metropolitan area. The study is part of the Capital Region Sustainable Communities (CRSC) Initiative led by CARPC.

Bus Rapid Transit (BRT) is a high-frequency, limited-stop service that offers an improved customer experience on busy transit corridors. Faster service is accomplished by speeding passenger boarding, transit priority at traffic signals, and express service. Station improvements, information technology, and improved service reliability and vehicle comfort create a more user-friendly experience.

Please join planning staff and the consultant team at a public meeting to learn more about BRT and provide your input on what the Madison metropolitan area's potential BRT system might look like.

For more information on the BRT Study, go to http://www.madisonareampo.org/BRT.cfm
For more information on the overall CRSC Initiative, go to http://www.capitalregionscrpg.org/

Appendix B

Station Two/Exercise Three*: What other screening criteria should be considered?*

- Not sharing lanes, buses with bikes; very unsafe and a horrible idea
- Not above, works out fine to share with bikes
- Poor people don’t have credit cards so allow cash prepayment and keep fares same as regular buses!
- With global warming and peak oil upon us, we need to reprioritize our transportation thinking. Key to this is to implement free buses (look at the success of the 80’s routes on campus). We heavily subsidize the transportation system of the previous century – it’s time for free buses, a public service like library, police, garbage, fire, etc.
- No fare buses in city like university buses. One note - $.50 - to suburban towns. Pay from public taxation.
- Free service should be limited to Madison residents. Those from outside Madison should not be subsidized by Madison taxpayers.
- Maximize low-emission vehicles (including emissions from power plants building the buses, etc.).
- East transfer station is awful. The Woodman’s transfer point is inaccessible to pedestrians in winter, i.e. no cleared sidewalks – terrible! The west transfer point looks dangerous to me, ditto south. I avoid all of them as a female on my own.
- BRT - go to Sun Prairie.
- Impact on existing bus routes.
- Impact on existing traffic on University Ave., East Washington and Park Street.
- How to create a network (grid?) of high-frequency transit routes to feed into BRT routes.
- Simplicity in the design (fewer turn = better).
- Move the most people safely and quickly at the least cost of ongoing subsidies.
- Why so many winding alternative? Keep the rapid in BRT – straight, direct, FAST!!!
- Stay off of State Street – it would be a “rapid” killer.
- Income (need for transit access).
- Air pollution reduction.
- Congestion mitigation.
- Parking demand reduction.
- Public health improvement (i.e. air quality, promoting walking).
- Distance to residences along walking paths (not as the crow flies, too misleading in Madison area).
- Opportunities to displace individual automobiles, i.e. a restricted bus lane on East Washington Ave.
- Strong coordination with local bus route service.
- Strong connections with bicycling opportunities to reinforce this mode of travel.
- Needs of those without cars.
- No winding routes. Keep it short and direct – people should use regular bus routes to access all the “winding” destinations. Don’t “wind”.

Appendix C

Comment Cards (As Written by BRT Public Meeting Participants)

- Middleton's employment areas seem not to be fully "counted". For example, the maps don't show the UW Medical Foundation (500 jobs) and the Spectrum site that is under construction (another 500).
- Impact on ADA Transition Plan should be another screening tool for routes and stops. Metro is required by federal law to make progress on ADA compliance, including and BRT upgrades.
- Fast (transit) by any means, ethically, possible.
- Feasibility should include sensitivity analysis with gas price as major independent variable. What does gas price need to be to make BRT feasible? Steve Arnold
- BRT/express is less important than increasing number of places in the city with 30 minute or better service. If you're traveling after 6:30 P.M. M-F or on the weekend, most routes don't run at all or go up to once an hour.
- Is there a positive impact on ridership where employers provide Metro benefits? If yes, continue outreach to local employers, especially in development corridors, ala East Washington.
- Stations appear to be too close together. Use 1/3 to ½ mile. Screening for corridor analysis should have been ½ mile (not ¼ mile). Try to consider walking distance (not crow flying). Steve Arnold
- Only goal 9 (TOD Development) is not related to transportation. Add goals for: parking demand reduction; health improvement; air pollution reduction; congestion mitigation. Steve Arnold
- Please include south corridor to essential facilities at, and vacant commercial land near, Fitchburg Civic Center (Fish Hatchery Rd. and Lacy Rd. or Research Park Dr. Steve Arnold
- Not RT. Please get a bus route out to Olson Elementary. Linden Park from Schroeder Park Ridge Elver area. Our parents can't ride public transportation to our school. Low income, very dense population. Also we have a large staff of 70 plus and 500 plus students. We would love to be connected to Madison!
- FAST. DIRECT. No winding routes!!! FAST!!!!!!!!
- Please consider extending the west corridor past West Towne to include roundabouts at future developments near UW Research Park.
- When designing this system it's important to take into account people's everyday needs like going to the grocery store. There should be stops at major stores like Woodman's East where I shop. Clinics too for medical care hospitals etc. plus housing like senior.
- Future map exercises should show the entire Metro service area. For example, most of Middleton was omitted from the maps used at tonight's input session.
- The North and East corridors are entirely logical but shouldn't there be additional corridors considered for the West Side, which is geographically much larger? For example, Monroe St. to Allied, and a route out to Middleton.

- Consider alternating BRT routes (buses) as follows: N – S, E – W, N – W, E – S (if feasible from a timing/scheduling standpoint, to provide more options with fewer transfers). Otherwise, the system builds in a bias for East – West and North to South service.
- Need direct connection from North Side to MATC.
- Expand NW on Northport instead of Airport. Airport not feasible – no ridership
- More redevelopment potential on Packers.
- Do not sacrifice biking. Roll bikes onto bus – racks in bus – will save time.
- North Sherman constricted; cannot expand.
- Add to the 9 point Good/Benefit list: Reduced complexity of getting from A to B. This is BRT's #1 benefit for me.
- Reduced obesity rates in cities with BRT's seems likely. Are there any studies? This would be a great selling point.
- Resist temptation to go to the airport.
- Have essential services at Fitchburg Civic Center (Lacy and Fish Hatchery Roads).
- I really think it's important to have park and rides on the beltline. I, personally, would never use them but if the suburbs can have a bus that travels, essentially non-stop, to downtown, that would really help increase ridership.
- MATC loop is irrelevant and redundant since there is now a shuttle.
- Eliminate loop by UW Hospital.
- Eliminate winding routes.
- Cottage Grove Express Bus.

Appendix D

Madison Area Transportation Planning Board
Transit Corridor Study
Public Meeting Agenda
6:00 – 8:00 PM, Wednesday, April 15th

1. Welcome and project overview
    - Bill Schaefer, Manager, Madison Area Transportation Board
    - Mayor Paul Soglin, City of Madison
    - Larry Palm, Chair, Capital Area Plan Commission

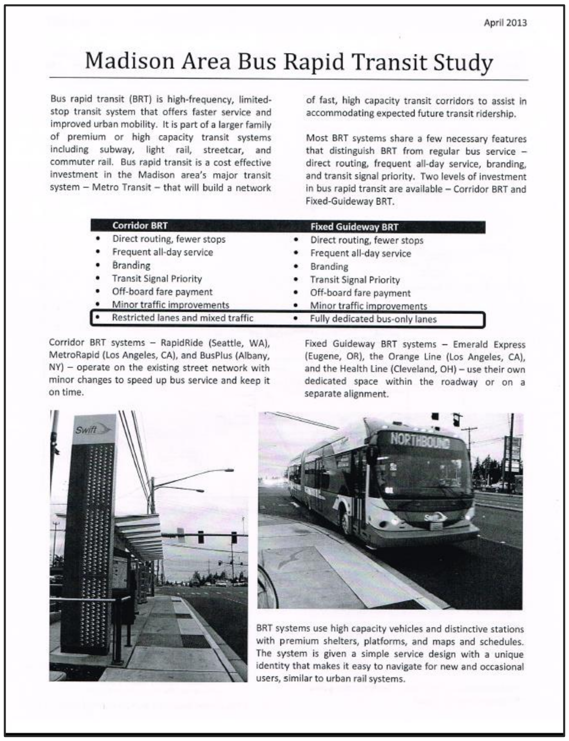
2. Bus Rapid Transit (BRT) Transit Corridor Study – Presentation of findings, Joe Kern, SRF

3. Question and answer session

4. Open house
    - Review of corridors (large boards)
    - Fill out community survey

Project boards can also be viewed on the project website www.madisonareampo.org/BRT.cfm

The community survey can be accessed at www.surveymonkey.com/s/BRTCommunityInput



April 2013

Madison Area Bus Rapid Transit Study

Bus rapid transit (BRT) is high-frequency, limited-stop transit system that offers faster service and improved urban mobility. It is part of a larger family of premium or high capacity transit systems including subway, light rail, streetcar, and commuter rail. Bus rapid transit is a cost effective investment in the Madison area's major transit system – Metro Transit – that will build a network of fast, high capacity transit corridors to assist in accommodating expected future transit ridership.

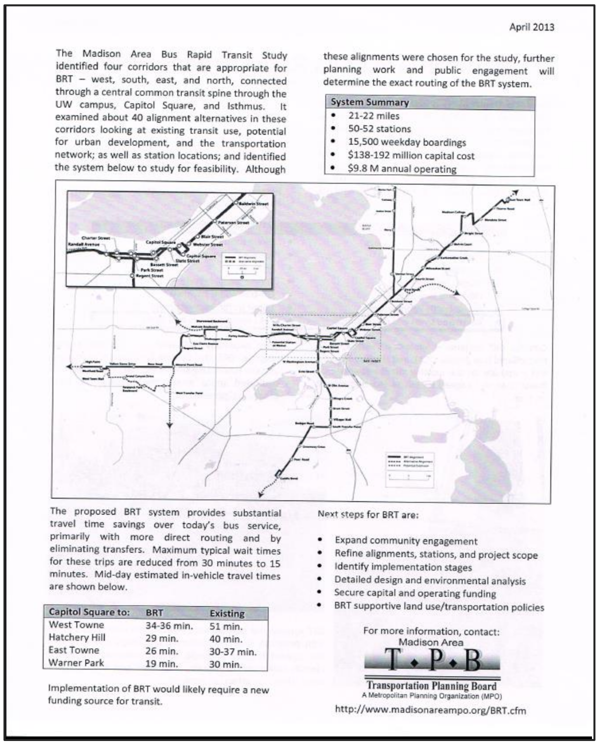
Most BRT systems share a few necessary features that distinguish BRT from regular bus service – direct routing, frequent all-day service, branding, and transit signal priority. Two levels of investment in bus rapid transit are available – Corridor BRT and Fixed-Guideway BRT.

Corridor BRT	Fixed Guideway BRT
• Direct routing, fewer stops	• Direct routing, fewer stops
• Frequent all-day service	• Frequent all-day service
• Branding	• Branding
• Transit Signal Priority	• Transit Signal Priority
• Off-board fare payment	• Off-board fare payment
• Minor traffic improvements	• Minor traffic improvements
• Restricted lanes and mixed traffic	• Fully dedicated bus-only lanes

Corridor BRT systems – RapidRide (Seattle, WA), MetroRapid (Los Angeles, CA), and BusPlus (Albany, NY) – operate on the existing street network with minor changes to speed up bus service and keep it on time.

Fixed Guideway BRT systems – Emerald Express (Eugene, OR), the Orange Line (Los Angeles, CA), and the Health Line (Cleveland, OH) – use their own dedicated space within the roadway or on a separate alignment.

BRT systems use high capacity vehicles and distinctive stations with premium shelters, platforms, and maps and schedules. The system is given a simple service design with a unique identity that makes it easy to navigate for new and occasional users, similar to urban rail systems.



April 2013

The Madison Area Bus Rapid Transit Study identified four corridors that are appropriate for BRT – west, south, east, and north, connected through a central common transit spine through the UW campus, Capitol Square, and Isthmus. It examined about 40 alignment alternatives in these corridors looking at existing transit use, potential for urban development, and the transportation network; as well as station locations; and identified the system below to study for feasibility. Although these alignments were chosen for the study, further planning work and public engagement will determine the exact routing of the BRT system.

System Summary
- 21-22 miles
- 50-52 stations
- 15,500 weekday boardings
- $138-192 million capital cost
- $9.8 M annual operating

The proposed BRT system provides substantial travel time savings over today's bus service, primarily with more direct routing and by eliminating transfers. Maximum typical wait times for these trips are reduced from 30 minutes to 15 minutes. Mid-day estimated in-vehicle travel times are shown below.

Capitol Square to:	BRT	Existing
West Towne	34-36 min.	51 min.
Hatchery Hill	29 min.	40 min.
East Towne	26 min.	30-37 min.
Warner Park	19 min.	30 min.

Implementation of BRT would likely require a new funding source for transit.

Next steps for BRT are:

- Expand community engagement
- Refine alignments, stations, and project scope
- Identify implementation stages
- Detailed design and environmental analysis
- Secure capital and operating funding
- BRT supportive land use/transportation policies

For more information, contact:
Madison Area
T ◆ P ◆ B
Transportation Planning Board
A Metropolitan Planning Organization (MPO)
http://www.madisonareampo.org/BRT.cfm

Madison Area Bus Rapid Transit Study

Public Information Meeting

6 to 8 PM, Monday, April 15th
Madison Senior Center, 330 West Mifflin Street

The Madison Area Transportation Planning Board (MPO), in cooperation with Metro Transit and the Capital Area Regional Planning Commission (CARPC), has been leading a study to explore where and how to implement Bus Rapid Transit (BRT) in the Madison metropolitan area and estimate its potential benefits, cost, and impacts. The study is part of the Capital Region Sustainable Communities (CRSC) Initiative led by CARPC.

BRT is a high-frequency, limited-stop transit system that offers faster service and improved urban mobility. Faster service is accomplished by speeding passenger boarding, transit priority at traffic signals, less frequent stops, and in some cases restricted or fully dedicated bus lanes. Station improvements, information technology, and improved service reliability and vehicle comfort create a more user-friendly experience. BRT is part of a larger group of premium or high capacity transit systems, including various types of rail service.

The consultant team has nearly completed its work and will be presenting its findings for public review. Come learn about the potential for a Madison area BRT system and share your thoughts and comments.

For more information on the BRT Study, go to http://www.madisonareampo.org/BRT.cfm

For more information on the overall CRSC Initiative, go to http://www.capitalregionscrpg.org/

Appendix E

Survey Data

Question 1

Do you currently use Metro Transit?		
Answer Options	**Response Percent**	**Response Count**
Always	24.2%	16
Often	31.8%	21
Occasionally	24.2%	16
Never	19.7%	13
	answered question	66
	skipped question	2

Question 2

How likely would you be to use the BRT system?		
Answer Options	**Response Percent**	**Response Count**
Very likely	36.9%	24
Likely	29.2%	19
Neutral	4.6%	3
Somewhat likely	7.7%	5
Not likely	21.5%	14
Additional comments?		13
	answered question	65
	skipped question	3

Question 3

Which elements of Bus Rapid Transit are most important to you?						
Answer Options	**Very important**	**Important**	**Neutral**	**Somewhat important**	**Not important**	**Response Count**
Direct routing	26	24	5	4	4	63
Frequent all-day service	35	15	4	4	6	64
Off-board fare payment	14	12	18	4	16	64
Faster service with fewer delays	37	16	5	2	4	64
Dedicated bus-only lanes	16	18	13	5	12	64
Proximity to bus stop	17	31	6	3	5	62
					answered question	66
					skipped question	2

Question 4

Does the Central Segment, detailed above, meet your transportation needs?		
Answer Options	**Response Percent**	**Response Count**
Very likely	30.3%	20
Likely	30.3%	20
Neutral	10.6%	7
Somewhat likely	10.6%	7
Not likely	18.2%	12
Additional comments?		13
	answered question	**66**
	skipped question	**2**

Question 5

Does the West Corridor, detailed above, meet your transportation needs?		
Answer Options	**Response Percent**	**Response Count**
Very likely	17.5%	11
Likely	36.5%	23
Neutral	12.7%	8
Somewhat likely	11.1%	7
Not likely	22.2%	14
Additional comments?		17
	answered question	**63**
	skipped question	**5**

Question 6

Does the South Corridor, detailed above, meet your transportation needs?		
Answer Options	**Response Percent**	**Response Count**
Very likely	20.3%	13
Likely	18.8%	12
Neutral	21.9%	14
Somewhat likely	12.5%	8
Not likely	26.6%	17
Additional comments?		13
	answered question	**64**
	skipped question	**4**

Question 7

Does the East Corridor, detailed above, meet your transportation needs?		
Answer Options	**Response Percent**	**Response Count**
Very likely	25.0%	15
Likely	26.7%	16
Neutral	21.7%	13
Somewhat likely	5.0%	3
Not likely	21.7%	13
Additional comments?		12
	answered question	**60**
	skipped question	**8**

Question 8

Does the North Corridor, detailed above, meet your transportation needs?		
Answer Options	**Response Percent**	**Response Count**
Very likely	8.1%	5
Likely	30.6%	19
Neutral	25.8%	16
Somewhat likely	11.3%	7
Not likely	24.2%	15
Additional comments?		16
	answered question	**62**
	skipped question	**6**

Question 9

Which corridors would you use most regularly? (Choose one or more)		
Answer Options	**Response Percent**	**Response Count**
West	64.2%	34
South	22.6%	12
East	39.6%	21
North	3.8%	2
	answered question	**53**
	skipped question	**15**

Question 10

Do the frequency (time between buses) and span (hours of operation) in the chart above meet your travel needs?		
Answer Options	**Response Percent**	**Response Count**
Yes	70.3%	45
No	12.5%	8
Maybe	17.2%	11
Additional comments?		17
	answered question	64
	skipped question	4

Question 11

Which elements of the BRT Station design are most important to you?						
Answer Options	**Very important**	**Important**	**Neutral**	**Somewhat important**	**Not important**	**Response Count**
Distinctive shelter design	11	10	21	3	17	62
Security cameras	20	20	9	5	10	64
Dynamic information signage with regular updates	31	23	1	5	4	64
Offboard fare collection	13	15	15	6	15	64
Bike racks	12	21	11	6	13	63
Bike shelter	9	17	16	7	14	63
Raised platform even with bus	14	14	13	4	17	62
Benches	18	20	11	8	6	63
Smart card reader	14	16	15	2	13	60
Newspaper box corral	5	7	20	3	25	60
Heating	15	13	16	10	10	64
Other (please specify)						14
					answered question	64
					skipped question	4

Question 12

Are you in favor of proceeding with the next steps toward the eventual implementation of a BRT system?		
Answer Options	**Response Percent**	**Response Count**
Yes	78.1%	50
No	21.9%	14
	answered question	64
	skipped question	4

Question 13

Do you have any additional comments or input on the recommendations, planning process or next steps?	
Answer Options	**Response Count**
	35
answered question	**35**
skipped question	**33**

Results from Public Involvement Activities

Results from Public Meeting One

Madison Transit Corridor Study – Results from Public Meeting Number One

Over 75 people attended the first Transit Corridor Study Public Meeting held on September 10, 2012. The two hour meeting included an introduction of Bus Rapid Transit (BRT) with a project presentation by Joe Kern of SRF Consulting, Inc. and additional presentations by Bill Schaefer, City of Madison (MPO), Chuck Kamp, Madison Metro, and Melissa Huggins, Urban Assets, LLC. A question and answer session followed the presentation during which meeting attendees were able to ask questions of the presenters. Meeting attendees were then encouraged to participate in several information gathering exercises.

Attendees were asked to sign in at the Welcome Table. The meeting agenda and additional materials on the project and project sponsors were available to participants. See Appendix A for the meeting agenda, and flyer that was sent via email to Madison Neighborhood Associations and posted on Metro buses to publicize the meeting.

Chuck Kamp from Madison Metro Presents on Metro's Recent Growth

Station Review and Community Input

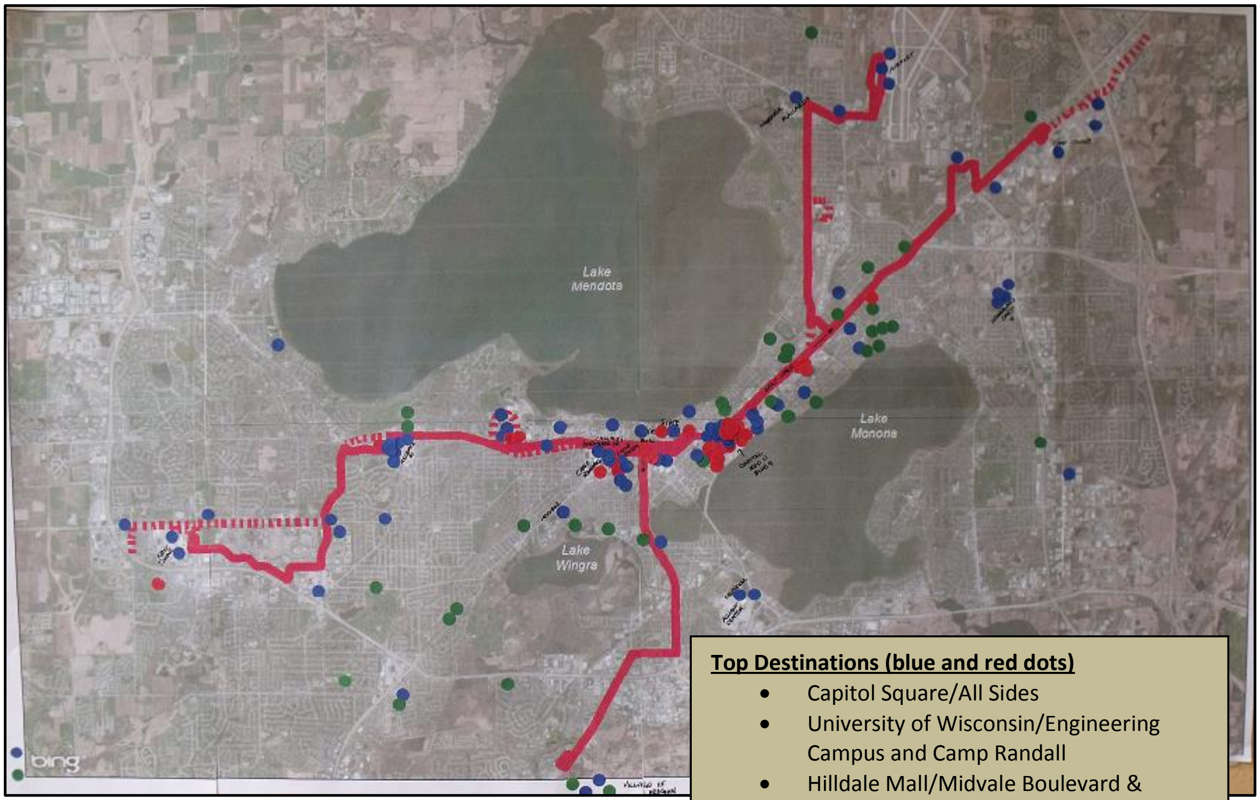
Station One: Project Overview

Project approach, working alignments, 2011 Metro Transit Ridership by Intersection, Metro system map and employment and housing density boards were placed on eight easels. The purpose of Station One was to educate participants about the project process and goals as well as the background information and analysis completed to date. SRF Consulting, Inc. and MPO, CRSC, and Metro staff were on hand to describe materials and answer questions.

Boards from Station One

Station Two: BRT Working Alignments

Exercise One – How might BRT change the way you travel throughout the Madison area?
North, South, East and West Corridor maps of the Madison area, noting initial BRT routes, were provided on large tables. Participants were given four colored dots (one green, one red, and two blue), and were asked to place the green dot at their residence, the red dot at their workplace, and the *blue dots on two of their top destinations.* The purpose of the exercise was to encourage participants to explore how the proposed BRT routes might enhance their transportation alternatives.



Top Destinations (blue and red dots)
- Capitol Square/All Sides
- University of Wisconsin/Engineering Campus and Camp Randall
- Hilldale Mall/Midvale Boulevard & University Ave
- Woodman's East/East Transfer Point
- University Hospital

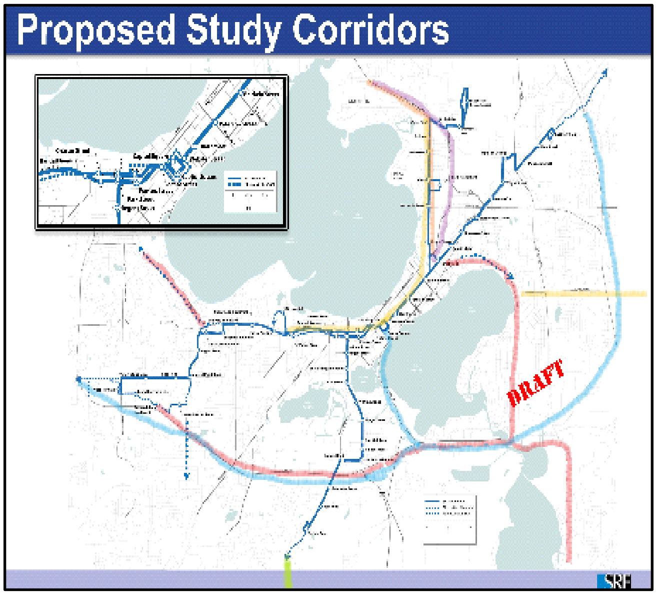
Responses Condensed onto One Map

Attendees Place Dots on Corridor Maps in Exercise Two

Exercise Two – Are there alternative routes that should be considered?

Participants were given an 8X11 Initial/Proposed Study Corridors Map and asked to indicate their preferred alternative routes using a marker. The purpose of the exercise was to provide input on route alternatives that may not have been considered. The alternate routes are highlighted on the map to the right and include the following:

- University Ave.
- Middleton, Beltline Highway
- I 39/90, Fish Hatchery Road
- Fitchburg, John Nolen Dr., Monona Dr.
- USH 51, Cottage Grove Road, Packers Ave.
- Northport Dr.



Proposed Study Corridors

Responses Condensed onto One Map

Exercise Three – What other screening criteria should be considered?[2]

Participants were encouraged to write additional screening criteria they felt should be considered in determining the BRT routes on a flip chart. The original screening criteria employed by the consultant team included the following:

- Employment within one-quarter mile
- Existing transit ridership along the route
- Population within one-quarter mile
- Development potential
- Roadway suitability

The following list summarizes the suggested screening criteria. A complete list is located in Appendix B.

- Low travel times
- Simple service design
- Impact to other transit service
- Bicycle Connections
- Parking demand reductions
- Congestion mitigation
- Public health/air quality

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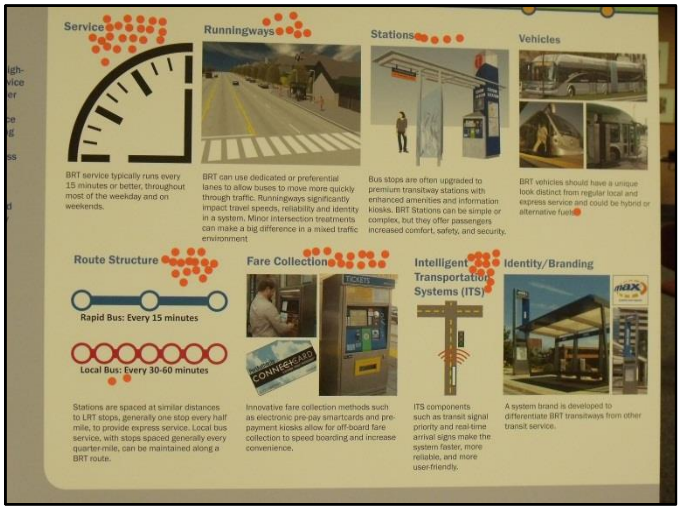
[2] A number of attendees participated in this exercise more than once.

Station Three: BRT Components and Amenities

Exercise Four - Which components and amenities do you think are most important for a successful BRT system for Madison?

Pictures and descriptions of BRT components and amenities were placed on two easels (including corridor BRT versus fixed guide way). Participants were asked to place orange dots (three) on their top priorities with the note that they could all be used for one priority, if desired. The results are listed from highest to lowest.

- Service (23)
- Route Structure (18)
- Fare Collection (14)
- ITS (12)
- Running ways (8)
- Stations (5)
- Fast and Direct (3)*[3]
- Vehicles (1)
- Identity/Branding (0)



Service

BRT service typically runs every 15 minutes or better, throughout most of the weekday and on weekends.

Runningways

BRT can use dedicated or preferential lanes to allow buses to move more quickly through traffic. Runningways significantly impact travel speeds, reliability and identity in a system. Minor intersection treatments can make a big difference in a mixed traffic environment

Stations

Bus stops are often upgraded to premium transitway stations with enhanced amenities and information kiosks. BRT Stations can be simple or complex, but they offer passengers increased comfort, safety, and security.

Vehicles

BRT vehicles should have a unique look distinct from regular local and express service and could be hybrid or alternative fuels

Route Structure

Rapid Bus: Every 15 minutes

Local Bus: Every 30-60 minutes

Stations are spaced at similar distances to LRT stops, generally one stop every half mile, to provide express service. Local bus service, with stops spaced generally every quarter-mile, can be maintained along a BRT route.

Fare Collection

Innovative fare collection methods such as electronic pre-pay smartcards and pre-payment kiosks allow for off-board fare collection to speed boarding and increase convenience.

Intelligent Transportation Systems (ITS)

ITS components such as transit signal priority and real-time arrival signs make the system faster, more reliable, and more user-friendly.

Identity/Branding

A system brand is developed to differentiate BRT transitways from other transit service.

Preferred BRT Components and Amenities

Station Three Participants

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[3] This BRT component/amenity was added to the list by meeting attendees.

Station Four: Redevelopment Opportunities and Other Potential Impacts

Redevelopment potential sites and current/future express bus services were placed on two easels. The purpose of Station Four was to educate participants about the connection between transportation and land use as well as other transit options. Metro and CSRC staff were on hand to answer questions.

Station Four Boards

Additional Community Input

In addition to the exercises at stations two and three, 3X5 cards were available at each station, and at the entry table. Participants were asked to write down any comments, questions, concerns, or other feedback and place the card(s) in the basket on the entry table. The following includes a summary of some of the collected responses.[4] The complete list of responses is located in Appendix C.

- Future maps should show the entire metro area
- Middleton's employment areas seem not to be fully counted
- Impact on ADA Transition Plan should be another screening tool for routes a
- Expand NW on Northport instead of going to the Airport
- Do not sacrifice biking – roll bikes onto bus, will save time
- Feasibility should include sensitivity analysis with gas price as major independent variable
- BRT is less important than increasing number of places in the city with 30 minute or better service
- Consider extending west corridor past West Towne to include future developments in Research Park
- Consider additional corridors for West side which is geographically larger
- Add goals for parking demand reduction, health improvement, air pollution reduction and congestion mitigation
- Stations appear to be too close together - should be one third to one half mile apart
- Stations Include Park and Rides on the Beltline

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[4] A number of attendees participated in this exercise more than once.

- Take in to account people's everyday transportation needs: grocery stores, medical clinics, senior housing

Results from Public Meeting Two

Over 75 people attended the second Transit Corridor Study Public Meeting held on April 15, 2013. The two hour meeting and open house included a welcome and project overview by Bill Schaefer, Manager, Madison Area Transportation Planning Board, and comments by Madison Mayor Paul Soglin and Larry Palm, Chair of the Capital Area Regional Planning Commission. This was followed by a Bus Rapid Transit (BRT) Transit Corridor Study – Presentation of Findings by Joe Kern, SRF Consulting Group, Inc. A question and answer session followed the presentation during which meeting attendees were able to ask questions of the presenters. Meeting attendees were encouraged to look at the corridor boards on display and fill out the community survey.

Attendees were asked to sign in at the Welcome Table. The meeting agenda and Madison Area Bus Rapid Transit Study Flyer were available for attendees. See Appendix D for the meeting agenda, study flyer and the flyer that was sent to Madison Neighborhood Associations via email, and posted on Metro buses to publicize the public meeting.

Madison Transit Corridor Study
Investigating Bus Rapid Transit in the Madison Area
MADISON SENIOR CENTER

Larry Palm, Chair of the Capital Area Regional Planning Commission

Joe Kern, of SRF Consulting Group, Inc. Presents the BRT Transit Corridor Study Findings

Survey from Public Meeting Two

The BRT online community survey was completed by 69 participants. Of those participants, the majority are in favor of supporting the implementation of a BRT system in Madison. According to survey results, 66% of participants are likely or very likely to use a BRT system, while 78% are in favor of proceeding with the next steps toward the eventual implementation of a BRT system.

Of the five corridors—Central, West, South, East, North—the majority of respondents, 64%, say they would use the West corridor most regularly followed by the East corridor at 40%. 70% of respondents felt the proposed frequency (time between buses) and span (hours of operation), were acceptable.

Bill Schaefer, Manager, Madison Area Transportation Planning Board and Chuck Kamp of Madison Metro Talk to Meeting Participants

The three most important elements of a BRT System for the respondents were faster service/fewer delays, frequent all day service, and direct routing. The four top elements for the BRT stations were safety, informational signage with regular updates, benches, and bike racks.

Below are the survey results and individual comments for each survey question. The survey's raw data is available in the Appendix E.

Meeting Attendees View Corridor Boards

Madison Area Transportation Planning Board – An MPO

Madison Transit Corridor Study

A Project of the Capital Region Sustainable
Communities Partnership

Universe of Alternatives Initial Review

8/14/2012

Prepared by the
SRF Consulting Group Team

Table of Contents

Introduction **1**
Methodology **3**
Results and Discussion **6**
CENTRAL CORRIDOR **6**
Segment A Alternatives *6*
EAST CORRIDOR **8**
Segment B Alternatives *8*
NORTH CORRIDOR **10**
Segment C Alternatives *11*
SOUTH CORRIDOR **13**
Segment D Alternatives *13*
Segment E Alternatives *15*
WEST CORRIDOR **15**
Segment F Alternatives *16*
Segment G Alternatives *18*
Segment H Alternatives *20*
Segment I Alternatives *21*
Segment J Alternatives *22*
Appendix A **24**

Tables

Table 1: Alignment Segment Descriptions *3*
Table 2: Central Corridor Characteristics *6*
Table 3: Segment A Rating Overview *8*
Table 4: East Corridor Characteristics *8*
Table 5: Segment B Rating Overview *10*
Table 6: North Corridor Characteristics *11*
Table 7: Segment C Rating Overview *13*
Table 8: South Corridor Characteristics *13*
Table 9: Segment D Rating Overview *15*
Table 10: West Corridor Characteristics *16*
Table 11: Segment F Rating Overview *18*
Table 12: Segment G Rating Overview *19*

Figures

Figure 1: Initial Universe of Alternatives *2*
Figure 2: Initial Universe of Alignment by Segment *5*

Introduction

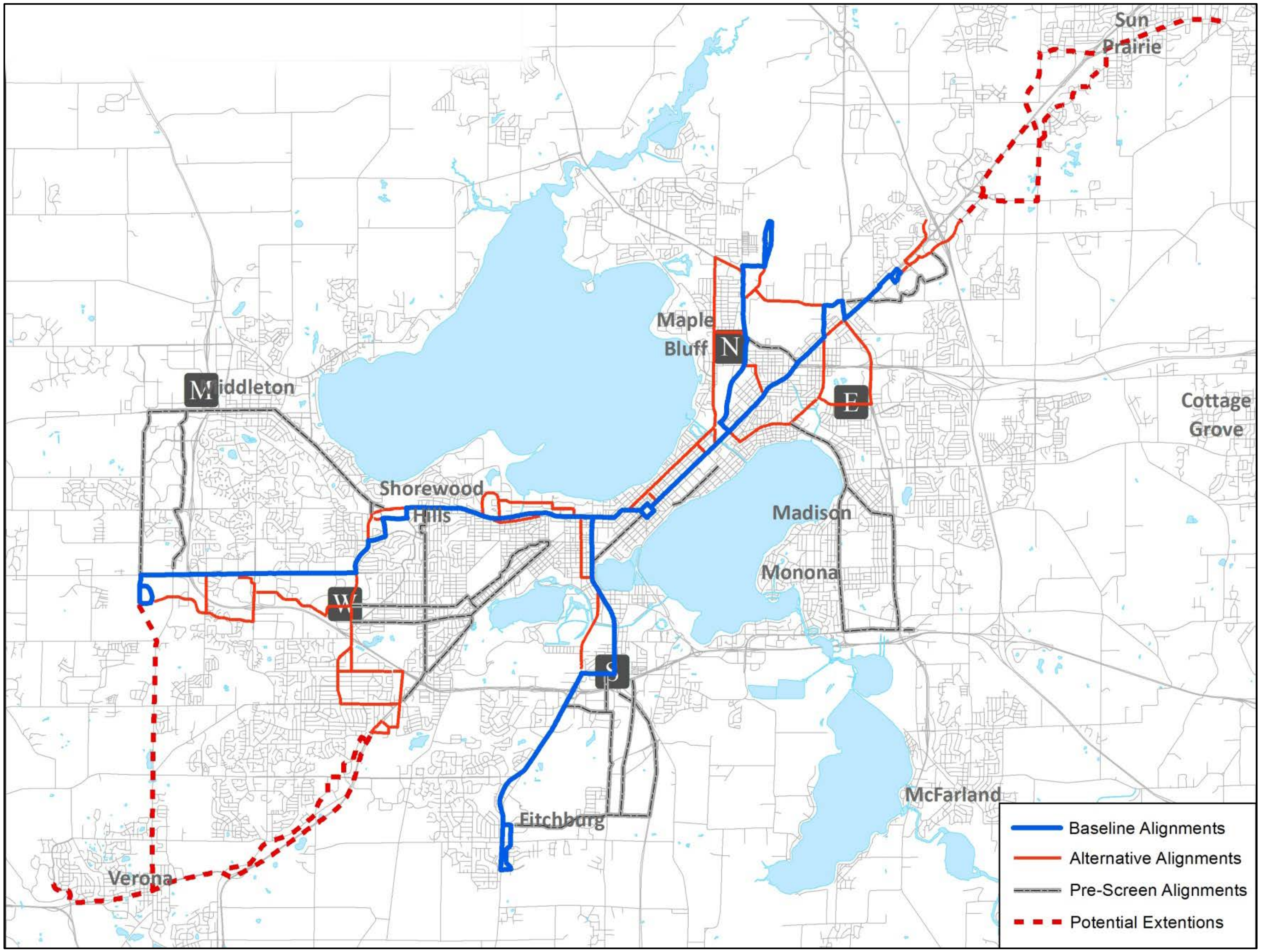
This document presents background information on travel corridors within the greater Madison area to identify which should be evaluated in more detail for potential implementation of bus rapid transit (BRT) service. BRT is an investment in bus service along selected travel corridors that is designed to provide fast, frequent and comfortable service. Corridors with high transit ridership, population, employment and development potential, along with reasonable travel conditions, generally provide the best opportunities to develop BRT service.

The corridor segments depicted in this review represent the first step in defining potential BRT service alignments. As subsequent steps are completed during the course of the study, refinement of these options will take place. There is also potential for new alignments to emerge.

The universe of alternatives considered for this review was developed by the staff at the Madison Area Transportation Planning Board; the area's metropolitan planning organization (MPO). The set of alternatives identified for initial consideration is shown in Figure 1. These alignment alternatives cover four corridors, each arranged radially around Capitol Square and oriented towards the North, East, South, and West transfer points. Common to all radial corridors is the Central Corridor which spans from east of the capitol to the University of Wisconsin campus. Several alternative routings along the main corridors, as well as potential future extensions to Sun Prairie, Monona, Middleton, and Verona, have been considered in this initial review. Additional corridors and travel segments were suggested by stakeholders in the early stages of the study, but were screened out by MPO staff for not meeting minimal acceptance levels. The additional segments initially suggested but screened out are described in Appendix A.

To identify the alignments with characteristics most suitable for further consideration of BRT service the strengths and weaknesses of the alternatives shown in Figure 1 were reviewed using a standard set of criteria. The results of the corridor review follows.

Figure 1: Initial Universe of Alternatives



Methodology

To evaluate strengths and weaknesses of competing alternatives, each potential routing was measured in terms of five primary criteria: population, employment, existing ridership, transit oriented development (TOD) opportunities, and basic roadway characteristics. A summary of these measures and their sources is provided below. Some of the evaluation criteria use a ¼-mile buffer from the route alignment to determine the impact area of each alternative. This is a commonly used distance that represents the maximum distance that the majority of bus riders will walk to access the transit network.

- **Population within ¼-mile:**
  - Greater concentrations of population allow routes to operate more productively by serving a larger population with fewer resources.
  - The population of census blocks with centroids within ¼-mile was calculated for each alignment. Segment totals were assigned a value of low, medium or high population. These values were assigned within the context of each individual segment, not across the greater Madison area as a whole.
  - Data Source: 2010 US Decennial Census

- **Employment within ¼-mile:**
  - As with population density, a higher concentration of jobs allows transit routes to provide service more effectively. Segment totals were assigned a value of low, medium or high employment. These values were assigned within the context of each individual segment, not across the greater Madison area as a whole.
  - The number of jobs within the ¼-mile buffer was calculated at the Traffic Analysis Zone (TAZ) level. Because TAZs cover a relatively large area, the number of jobs was based on the employment density of each TAZ and the proportional share of the TAZ covered by the ¼-mile buffer.
    - *Example*: Assume a TAZ with 100 jobs per acre. One-third of the TAZ is covered by the alignment buffer; therefore 33 jobs are counted from the TAZ for that alignment.
  - Data Source: Employment data from InfoUSA and adjusted by the MPO, aggregated to the Traffic Analysis Zone (TAZ).

- **Existing transit ridership along route:**
  - Existing Metro customers represent the current demand for transit service in an area.
  - Passengers boarding at Metro stops along the alignments were used to calculate the average weekday daily ridership per segment.
  - Ridership at transfer points was excluded from this analysis because it is assumed that all alignment alternatives, with the exception of the East Corridor, would serve existing or relocated transfer points. Also, transfer point ridership is difficult to measure because some riders will continue using other routes available there or may have different travel patterns with a reconfigured transit network.

  - Data Source: Average weekday daily ridership, October 2011 Metro farebox boarding data.

- **Transit Oriented Development (TOD) potential along corridor:**
  - TODs, developments designed and built to encourage transit use, increase demand for—and are benefitted by—high quality transit along a corridor.
  - TOD potential were gauged as low, medium or high based on visual inspection of existing land uses, the City of Madison Comprehensive Plan (2006), and work performed thus far by CARPC for the TOD Market Study. These values were assigned within the context of each individual segment, not across the greater Madison area as a whole.
  - Data Source: 2006 Madison Comprehensive Plan, aerial photos, and other sources.

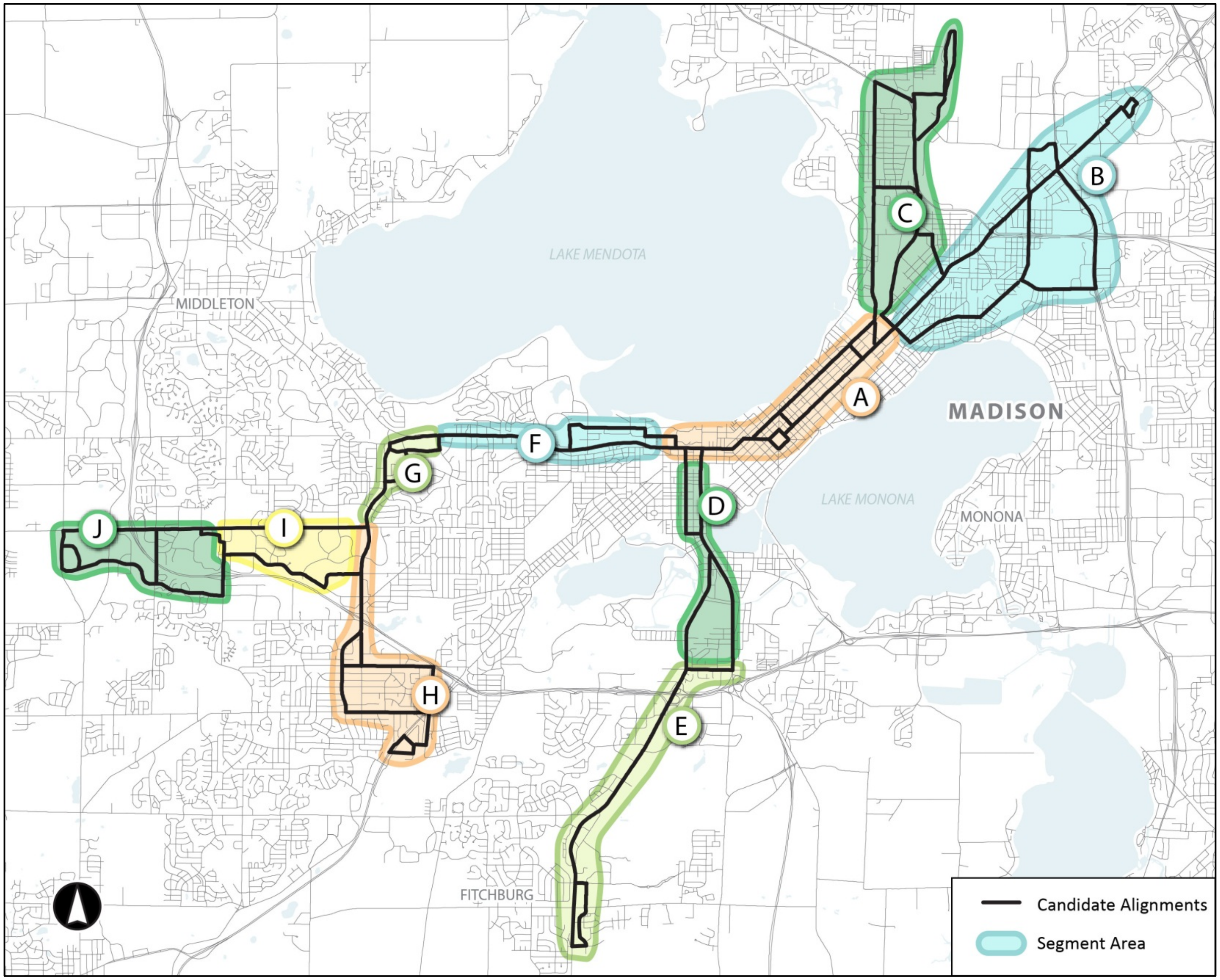
- **Roadway suitability:**
  - The functional class of a roadway as well as speed, right-of-way, and traffic volumes all effect the implementation of a BRT system.
  - Alignment road suitability gauged as low, medium or high based on the ease of implementing the highest class of BRT service along the alignment.
  - Data Source: Roadway functional classification geographical information maintained by the MPO, City of Madison Traffic Flow Maps, and aerial photos.

The initial universe of alternatives was divided into groupings of two to five alternatives. Each of these groupings corresponded to the potential routing alternatives between major destination points or points of divergence in the baseline alignments (e.g., the point at which the north and east alignments diverge from their shared alignment through the Isthmus). This approach allowed the alternatives within each segment to be directly compared and contrasted to each other in order to identify the alignment with the best potential for further BRT planning. The approximate extents of each segment are described in Table 1 and show below in Figure 2.

Table 1: Alignment Segment Descriptions

Corridor	Segment ID	Description
Central	A	This segment is located entirely within Central Madison encompassing the University of Wisconsin-Madison campus, Capitol Square, and the Isthmus.
East	B	This segment continues east of Segment A between First Street and East Towne Mall.
North	C	This segment continues north of Segment A at First Street and assumes the terminus of the north alignment would be located at or near the Dane County Regional Airport.
South	D	This segment continues south of Segment A from the University of Wisconsin-Madison campus and to the South Transfer Point.
South	E	This segment extends south of Segment D from the South Transfer Point to Fitchburg.
West	F	This segment continues west of Segment A from Randall Avenue to Hill Farms along the University Avenue Corridor.
West	G	This segment continues south of Segment F from Hill Farms to Westgate.
West	H	This segment continues south of Segment G from Westgate to the Allied/Dunn’s Marsh Neighborhood. The BRT route would likely need to follow either Segment H or Segments I and J.
West	I	This segment continues west of Segment G from Westgate to West Towne. The BRT route would likely need to follow either Segment H or Segments I and J.
West	J	This segment continues west of Segment I from West Towne to the planned University Research Park Phase II Development near Mineral Point Road and Pleasant View Road. The BRT route would likely need to follow either Segment H or Segments I and J.

Figure 2: Initial Universe of Alternatives by Segment



Results and Discussion

CENTRAL CORRIDOR

The central corridor is the shared segment of the BRT system that connects the UW campus, State Street, Capitol Square, and East Washington Avenue. Most existing bus routes that serve central Madison operate on some part of this corridor. Transit oriented development opportunities exist along East Washington Avenue.

Table 2: Central Corridor Characteristics

Approximate Length	2.7 miles (Randall Avenue to Baldwin Street)
Existing Metro Bus Routes in the Area	West of Capitol Square: 2, 3/7, 11, 12, 14/8, 15, 56, 57, 58, 70, 71, 72, 74 East of Capitol Square: 6, 14, 15, 25, 27, 29, 37, 56, 57
Existing Travel Time	Randall Avenue to Baldwin Street: Routes 14/15: 16 minutes
Corridor Challenges	Traffic congestion on Johnson Street; pedestrian, bicycle, and loading conflicts on State Street; and traffic signal timing on State Street

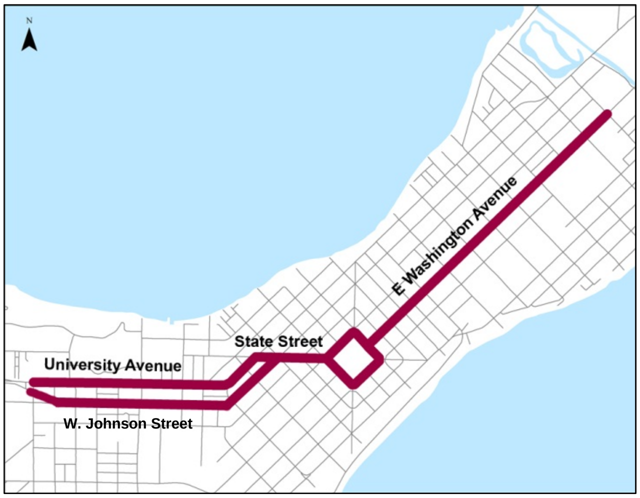
Segment A Alternatives

This segment is located entirely within Central Madison between the University of Wisconsin-Madison campus, Capitol Square, and Baldwin Street. Street. This segment forms the basis of the central corridor.

Alternative A-1

Employment:	High
Ridership:	9,854
Population:	Medium
TOD Potential:	High
Roadway Suitability:	High

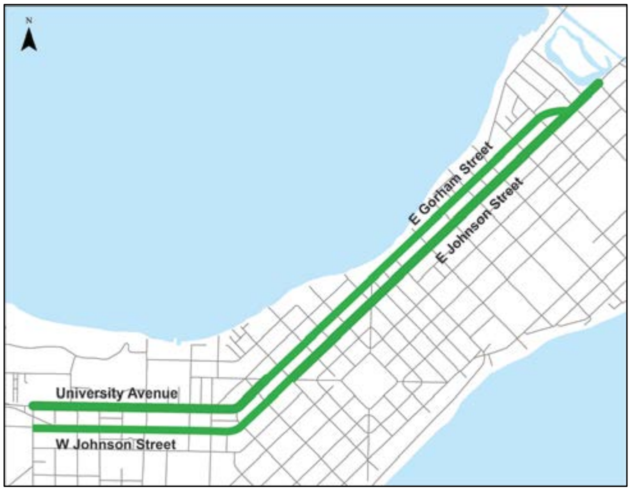
Description: This route takes the quickest and most direct path between the Capitol Square and 1st Street, following E. Washington Avenue entirely. It leaves the square via State Street and then accesses the University Avenue and W. Johnson Street couplet via W. Gorham Street.



Alternative A-2

Employment:	High
Ridership:	7,774
Population:	High
TOD Potential:	Low
Roadway Suitability:	Medium

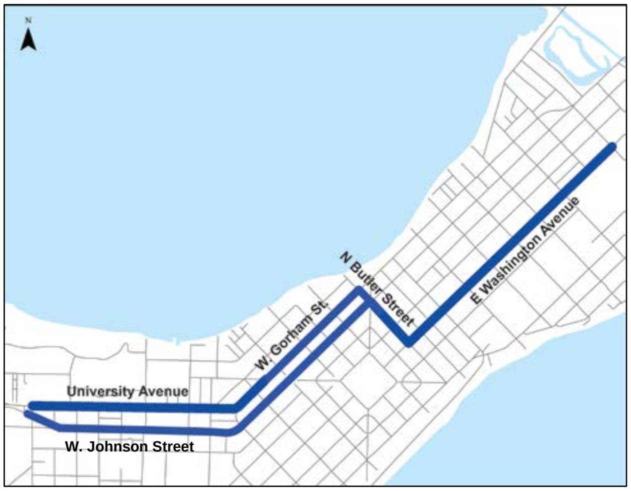
Description: Alternative A-2 bypasses the Capitol Square using the E. Johnson / E. Gorham Street Couplet.



Alternative A-3

Employment:	High
Ridership:	7,892
Population:	Medium
TOD Potential:	Medium
Roadway Suitability:	Medium

Description: Alternative A-3 bypasses the Capitol Square using the E. Johnson / E. Gorham Street Couplet, then transitions to E. Washington Avenue via N. Butler Street.



Segment A Discussion

Because of the constrained geography of Central Madison caused by Lakes Monona and Mendota, there are a limited number of viable alternatives. Many existing bus routes travel through parts of this corridor, and Alternative A-1 is established as the fastest and most robust. Although most of the population on the Isthmus is concentrated north and south of E. Washington Avenue, major urban development is planned along E. Washington Avenue, which is more centrally located than other corridors and is within walking distance of most residences on the Isthmus. Additionally, the Johnson/Gorham Street couplet, Williamson Street, and Jenifer Street present major challenges for fast, reliable transit. See Appendix A for additional alternatives that were removed from the screening process, including Lower State Street, Broom/Bassett Streets, W. Washington Avenue, and the Capitol Loop. **Alternative A-1 is identified as the most promising alignment within Segment A to be advanced for further refinement.**

Table 3: Segment A Rating Overview

Segment A	**A1**	**A2**	**A3**
Employment	HIGH	HIGH	HIGH
Ridership	9,854	7,774	7,892
Population	MEDIUM	HIGH	MEDIUM
TOD Potential	HIGH	LOW	MEDIUM
Roadway Suitability	HIGH	MEDIUM	MEDIUM
	Most Promising		

EAST CORRIDOR

The east BRT line connects central Madison with established high density neighborhoods on the Isthmus, the MATC Truax campus, and retail areas at East Towne Mall. Transit oriented development opportunities exist along East Washington Avenue and in the East Towne area.

Table 4: East Corridor Characteristics

Length	4.5 miles (Baldwin Street to East Town Mall)
Existing Metro Bus Routes in Area	6, 25
Existing Travel Time	Capitol Square to East Towne Mall, Route 6: 30-37 minutes
Challenges	Traffic congestion on East Washington Avenue, service to MATC, connection from Anderson Street to East Washington Avenue, and transfers to other bus routes.

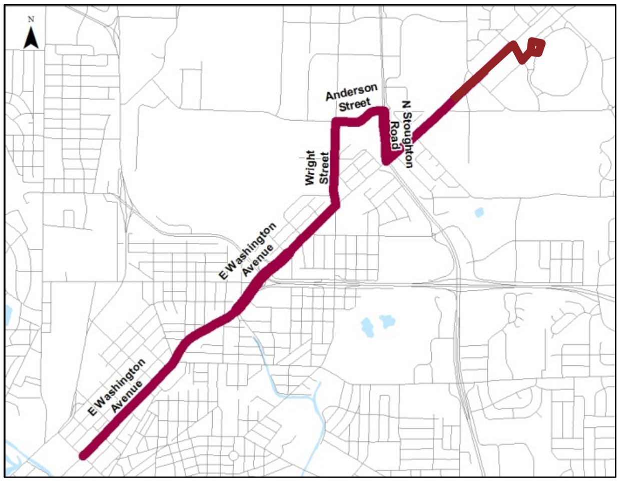
Segment B Alternatives

This segment continues east of Segment A between 1st Street and East Towne Mall.

Alternative B-1

Employment:	Medium
Ridership:	1,934
Population:	Medium
TOD Potential:	Medium
Roadway Suitability:	High

This route runs mainly along E. Washington Avenue from First Street to Eagan Road and East Towne, but deviates at Wright Street in order to serve the Madison Area Technical College (MATC).

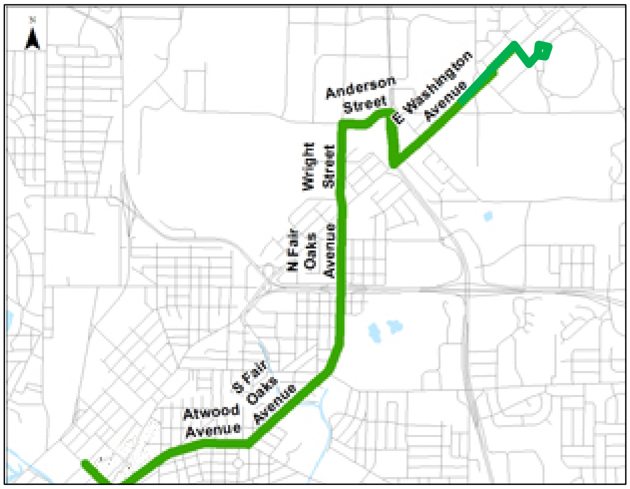


Alternative B-2

Employment:	Medium
Ridership:	1,347
Population:	Medium
TOD Potential:	Medium
Roadway Suitability:	Low

Description:

This route follows Atwood Avenue and Fair Oaks Avenue, serving Schenk's Corners, before serving MATC and continues to E. Washington Avenue. It is assumed that the East Transfer Point would be relocated to be served by this route.

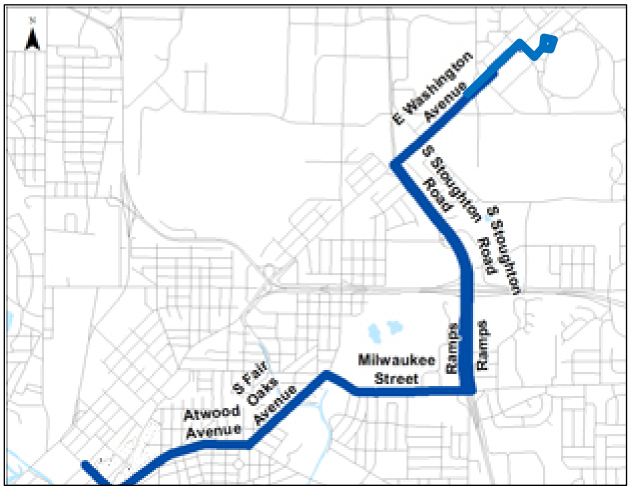


Alternative B-3

Employment:	Medium
Ridership:	1,222
Population:	Medium
TOD Potential:	Medium
Roadway Suitability:	Low

Description:

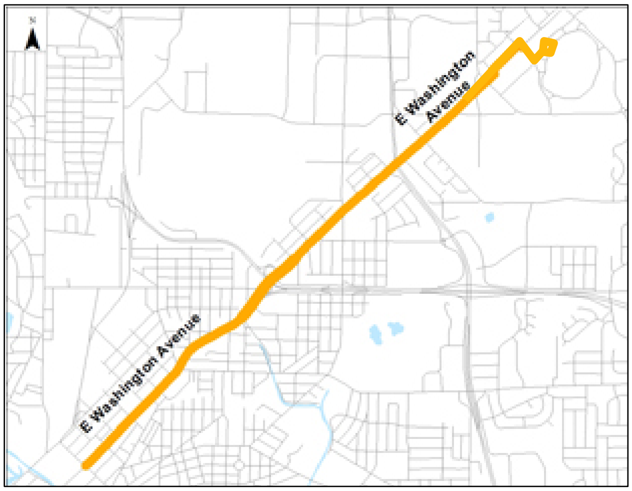
Similar to B-2, this route follows Atwood Avenue and Fair Oaks Avenue, but continues to the East Transfer Point before heading north on Stoughton Road and continuing to E. Washington Avenue and East Towne. The circuitous routing and high travel times results in a roadway suitability ranking of Low.



Alternative B-4

Employment:	Low
Ridership:	1,570
Population:	Low
TOD Potential:	Medium
Roadway Suitability:	High

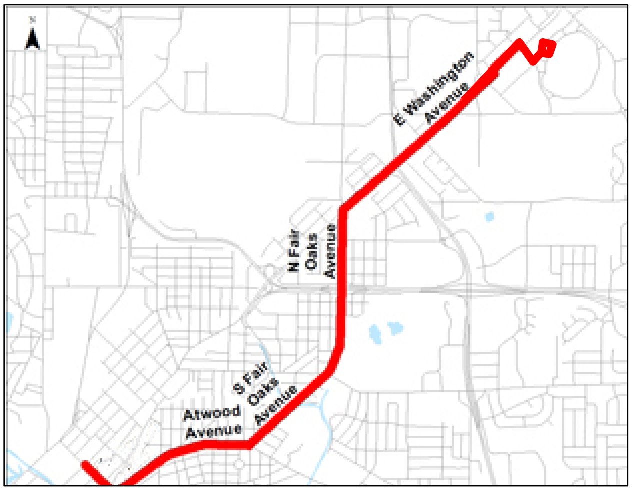
This routing takes the quickest and most direct path along E. Washington Avenue between First Street and East Towne.



Alternative B-5

Employment:	Low
Ridership:	1,218
Population:	Medium
TOD Potential:	Medium
Roadway Suitability:	Low

This routing differs from B-2 only in its lack of direct service to MATC, which negatively affects the levels of employment and ridership.



Segment B Discussion

The fastest and most direct routing through this segment would entirely follow E. Washington Avenue as in alternative B-4. However, the lack of available transfers from other routes through a transfer point and the relatively low-density nature along E. Washington Avenue necessitate the review of deviations. A direct comparison between B-1 and B-4 shows that the deviation to MATC offers a significant boost to employment and ridership with a relatively small impact to the directness of the route. This is essentially equivalent to the current routing of Route 6 via MATC, using Anderson Road instead of Kinsman Boulevard – a cut-off expected to save about three minutes. B-2, B-3, and B-5's deviations to serve transfers to east Madison service have an unacceptable level of circuitousness and high travel times. **Alternative B-1 is the most promising alignment within Segment B to be advanced for further refinement.**

Table 5: Segment B Rating Overview

Segment B	B1	B2	B3	B4	B5
Employment	MEDIUM	MEDIUM	MEDIUM	LOW	LOW
Ridership	1,934	1,347	1,222	1,570	1,218
Population	MEDIUM	MEDIUM	MEDIUM	LOW	MEDIUM
TOD Potential	MEDIUM	MEDIUM	MEDIUM	MEDIUM	MEDIUM
Roadway Suitability	HIGH	LOW	LOW	HIGH	LOW
	Most Promising				

NORTH CORRIDOR

The north BRT line connects central Madison with established high density neighborhoods on the Isthmus, apartments, potential future growth areas, and the Dane County Regional Airport. The North Transfer Point would potentially be relocated or reconfigured to allow transfers to other bus routes. Transit oriented development opportunities exist along East Washington Avenue and Sherman Avenue.

Table 6: North Corridor Characteristics

Length	4.4 miles (Baldwin Street to Dane County Regional Airport)
Existing Metro Bus Routes in Area	2, 4, 20, 21, 22, 27, 28, 29
Existing Travel Time	Capitol Square to Airport, Routes 2-20: 32 minutes
Challenges	Traffic congestion on East Washington Avenue, connection from East Washington Avenue to Fordem Avenue, North Transfer Point, connection from Northport Drive to International Lane

Segment C Alternatives

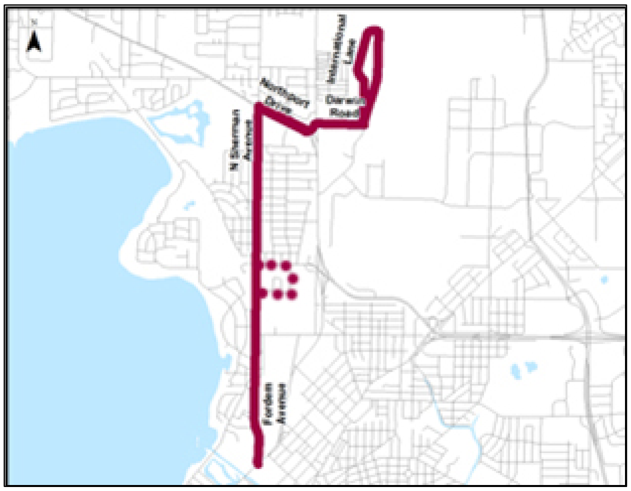
This segment continues north of Segment A at First Street and assumes the terminus of the north alignment would be located at the Dane County Regional Airport.

Alternative C-1

Employment:	Medium
Ridership:	632
Population:	Medium
TOD Potential:	Medium
Roadway Suitability:	Medium

Description:

This route follows Fordem Ave. and N. Sherman Ave. and accesses the Dane County Airport via Northport Dr., Darwin Dr., and International Ln. It assumes that the North Transfer Point will be relocated to be served by this route. If this is not feasible, Alternative C-1 would include a deviation to serve the NTP.

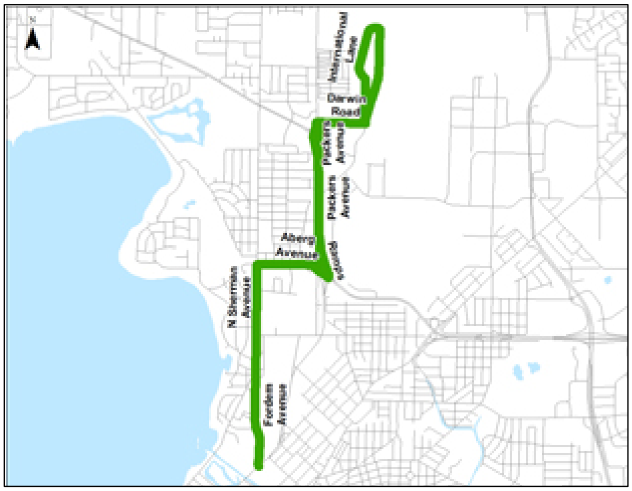


Alternative C-2

Employment:	Medium
Ridership:	530
Population:	Medium
TOD Potential:	Medium
Roadway Suitability:	Medium

Description:

This route runs on N. Sherman Ave., turns at Aberg Ave. and then accesses the Dane County Airport via Packers Ave., Darwin Rd., and International Ln. Buses would likely stop on Aberg Ave. to serve the North Transfer Point, but not enter it.

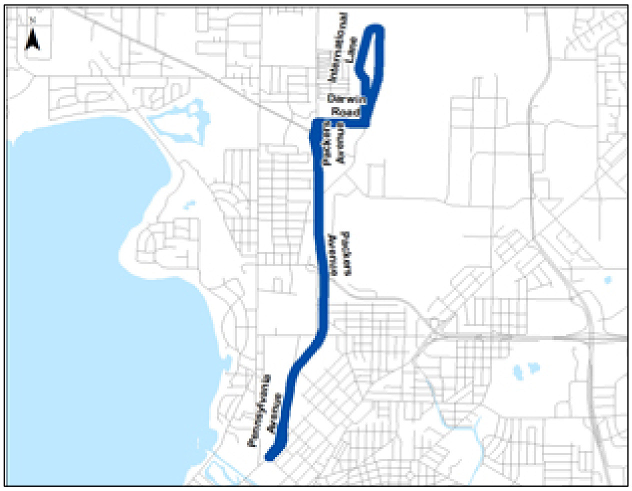


Alternative C-3

Employment:	Medium
Ridership:	157
Population:	Low
TOD Potential:	Low
Roadway Suitability:	High

Description:

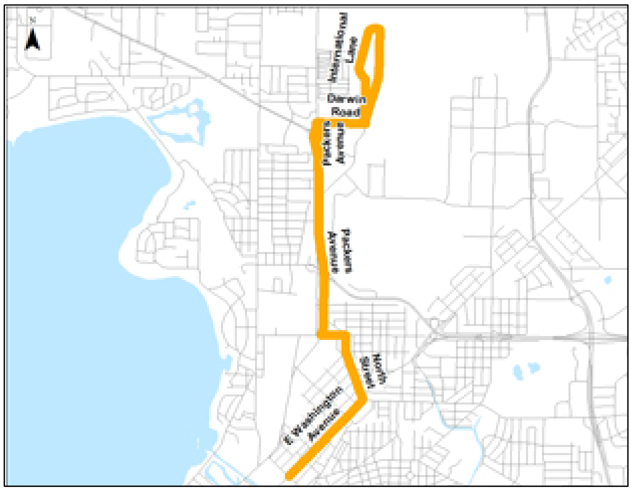
This route travels on Pennsylvania Ave. and Packers Ave., the most direct route to Dane County Regional Airport. It assumes that the North Transfer Point would be moved to the east to be served by this Route.



Alternative C-4

Employment:	Medium
Ridership:	710
Population:	Medium
TOD Potential:	Low
Roadway Suitability:	Medium

This route is similar to C-3 except that it uses North St. instead of First Street. This route is faster and more direct, but is duplicative of the East Corridor.



Segment C Discussion

Segment C links the Dane County Airport into the BRT system. The most major differences between the alternatives occur between those that use Packers Avenue versus those that use Sherman Avenue. While the alternatives that run along Packers Avenue have the potential for high operational speed, Packers Avenue, especially at the intersection of Aberg Avenue, is not pedestrian friendly and is dominated by low-density residential, industrial, and open space land uses. Using an alignment along Sherman Avenue would allow direct access to high density apartments at Sherman Terrace, the North Side Town Center, and many other destinations along with potential TOD sites identified in the City of Madison Comprehensive Plan. See Appendix A for other routing options that were explored. Many challenges exist to Alternative C-1, including the connection from E. Washington Ave. to Fordem Ave., relocating the North Transfer Point, and the connection from Northport Dr. to Darwin Rd. The connection from E. Washington Ave. to Fordem Ave. may be done with a busway in the rail corridor crossing the Yahara River; if that project proves to be infeasible, the routing would likely be via First St. and Johnson St. **Alternative C-1 is identified as the most promising alignment within Segment C to advance for further refinement.**

Table 7: Segment C Rating Overview

Segment C	C1	C2	C3	C4
Employment	MEDIUM	MEDIUM	MEDIUM	MEDIUM
Ridership	632	530	157	710
Population	MEDIUM	MEDIUM	LOW	MEDIUM
TOD Potential	MEDIUM	MEDIUM	LOW	LOW
Roadway Suitability	MEDIUM	MEDIUM	HIGH	MEDIUM
	Most Promising			

SOUTH CORRIDOR

The south BRT line connects a variety of land uses in south Madison and Fitchburg, including high density student housing, apartments, and future growth areas. Transit oriented development opportunities exist along South Park Street and on Fish Hatchery Road south of the Beltline Highway.

Table 8: South Corridor Characteristics

Length	4.5 miles (University Avenue to Caddis Bend)
Existing Metro Bus Routes in Area	4, 5, 40, 44, 47, 48
Existing Travel Time	Capitol Square to Caddis Bend, Routes 5-40: 50 minutes
Challenges	Traffic congestion on Park Street, South Transfer Point, Beltline Highway Crossing, service to Arbor Heights neighborhood

Segment D Alternatives

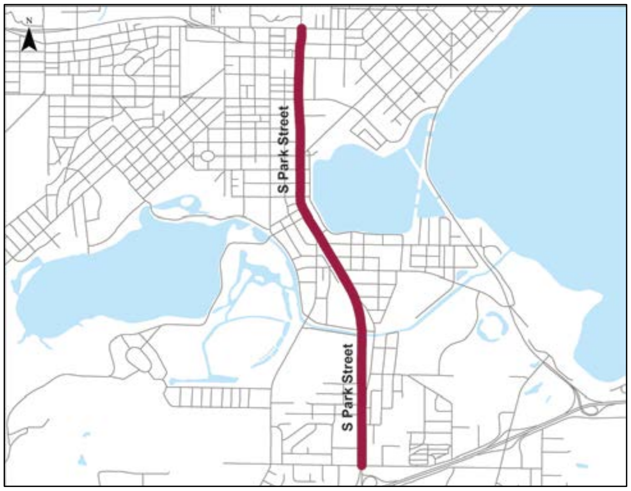
This segment continues south of Segment A from the University of Wisconsin-Madison to Badger Road and the South Transfer Point.

Alternative D-1

Employment:	Medium
Ridership:	1,066
Population:	Medium
TOD Potential:	High
Roadway Suitability:	High

Description:

This route runs down S. Park St. It eliminates the deviation to Fisher St. currently done by Route 5.

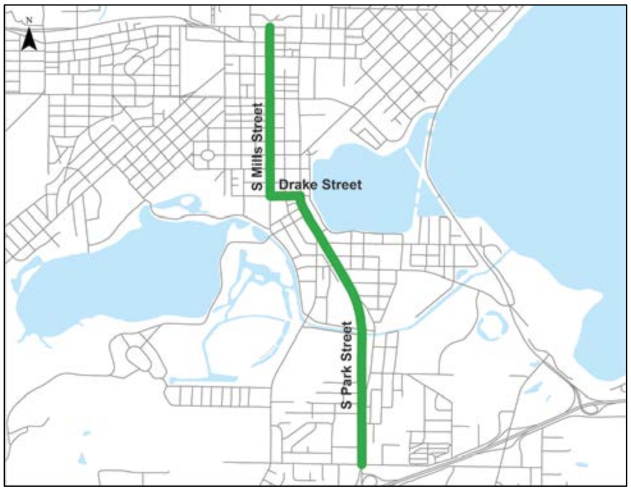


Alternative D-2

Employment:	Medium
Ridership:	2,501
Population:	High
TOD Potential:	High
Roadway Suitability:	Low

Description:

This routing differs from D-1 only in the use of Mills Street instead of Park Street between University Avenue and Erin Street.

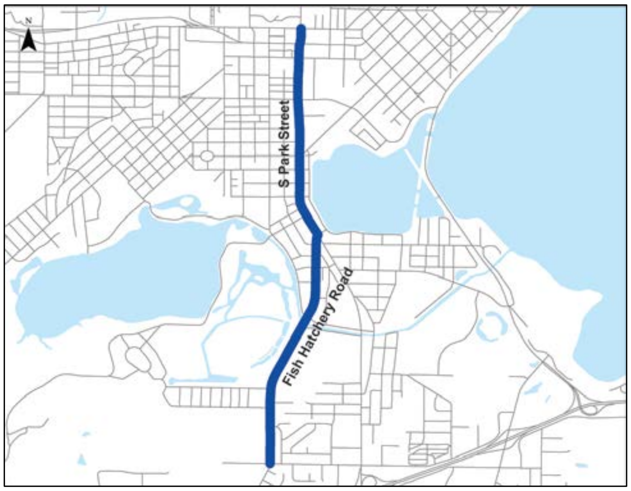


Alternative D-3

Employment:	Medium
Ridership:	4,332
Population:	Medium
TOD Potential:	Medium
Roadway Suitability:	High

Description:

This routing differs from D-1 only in the use of Fish Hatchery Road instead of Park street south of Lakeside Street. It assumes the South Transfer Point would be relocated to be served by this Route.

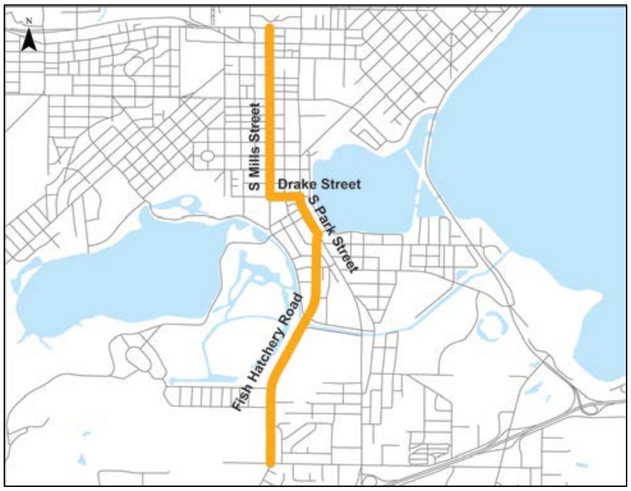


Alternative D-4

Employment:	Medium
Ridership:	2,534
Population:	Medium
TOD Potential:	Low
Roadway Suitability:	Low

Description:

This routing combines the Mills Street deviation from D-2 with the Fish Hatchery Road deviation from D-3 and assumes the South Transfer Point will be relocated to be served by this Route.



Segment D Discussion

Employment, population, and ridership levels are relatively similar along all four alternatives since they serve similar geographic areas north of Wingra Creek.. The deviation to serve Mills St. would increase access to population concentrations west of Park St., but would cause delays currently felt by Route 4. The Fish Hatchery Road routing would be faster than Park St., but Park St. has a substantial advantage in population and TOD potential, without the need to relocate the South Transfer Point. **Alternative D-1 is identified as the most promising alignment within Segment D to be advanced for further refinement**.

Table 9: Segment D Rating Overview

Segment D	D1	D2	D3	D4
Employment	MEDIUM	MEDIUM	MEDIUM	MEDIUM
Ridership	1,066	2,501	4,332	2,534
Population	MEDIUM	HIGH	MEDIUM	MEDIUM
TOD Potential	HIGH	HIGH	MEDIUM	LOW
Roadway Suitability	HIGH	LOW	HIGH	LOW
	Most Promising			

Segment E Alternatives

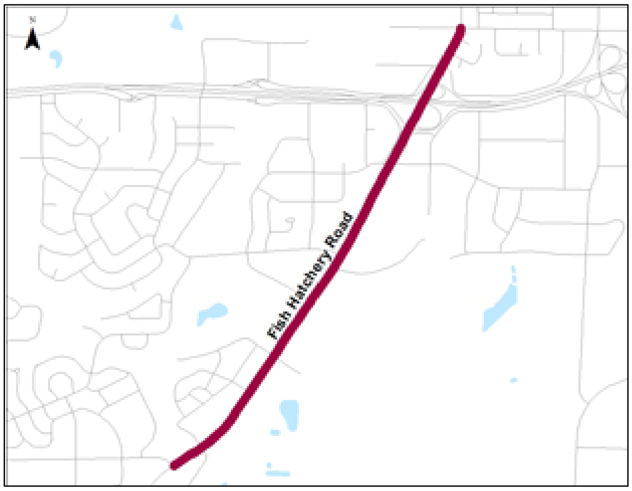
This segment extends south of Segment D from the South Transfer Point to McKee Road. It is suggested that a possible extension to E. Cheryl Pkwy and other destinations in Fitchburg not currently served by transit be deferred until planned future development occurs. .

Alternative E-1

Employment:	Medium
Ridership:	261
Population:	Low
TOD Potential:	Low
Roadway Suitability:	High

Description:

This routing operates entirely on Principal Arterial roadways along Fish Hatchery Road between Badger Road and McKee Road.



Segment E Discussion

Fish Hatchery Rd. is the only viable corridor south of the Beltline Hwy. See Appendix A for discussion on other possible alignments that were explored. **Alternative E-1 is the only alternative to advance for further refinement in this segment**.

WEST CORRIDOR

The west BRT line connects some of the highest ridership areas in Madison. Existing routes in the University Avenue corridor, from the Hill Farms neighborhood to the University of Wisconsin (UW)-Madison campus, experience chronic overcrowding while UW-Madison is in session. Transit oriented development opportunities exist along University Avenue and between Westgate and West Towne Mall.

Table 10: West Corridor Characteristics

Length	7.4 miles (Randall Avenue to High Point Road)
Existing Metro Bus Routes in Area	2, 14/8, 15, 56, 57, 67, 73/63
Estimated Travel Time	Capitol Square to West Towne, Routes 6-67: 51 minutes
Challenges	Traffic congestion on University Avenue, service to UW Hospital, left turns from Sheboygan Avenue to Segoe Road and Whitney Way, West Transfer Point, West Towne Mall.

Segment F Alternatives

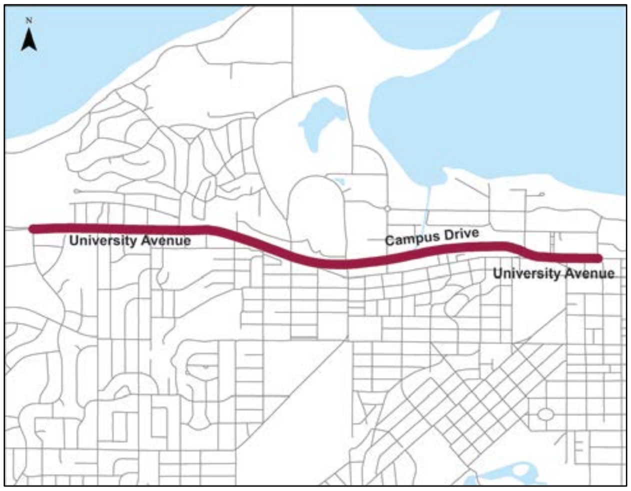
This segment continues west of Segment A from N. Randall Avenue to University Avenue at Segoe Road.

Alternative F-1

Employment: High
Ridership: 2,910
Population: High
TOD Potential: Low
Roadway Suitability: Medium

Description:

This routing runs directly west from N. Randall Ave. along Campus Drive to University Avenue and Segoe Road. Access to the hospitals along University Bay Dr. is provided by other routes or by walking ¼- to 3/8-mile north from Farley Ave.

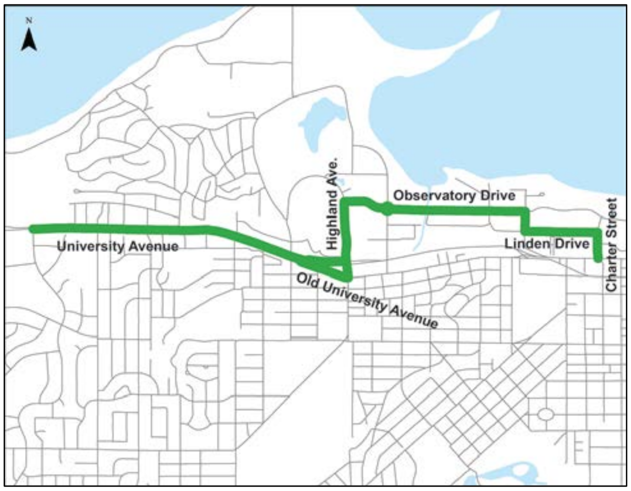


Alternative F-2

Employment: High
Ridership: 8,215
Population: High
TOD Potential: Low
Roadway Suitability: Low

Description:

This route sacrifices operational speed in order to provide direct service to the interior of University of Wisconsin's campus and the UW Hospital and Clinics. This area is currently served extensively by Route 80 with a high level of fare-free service and extremely high utilization.

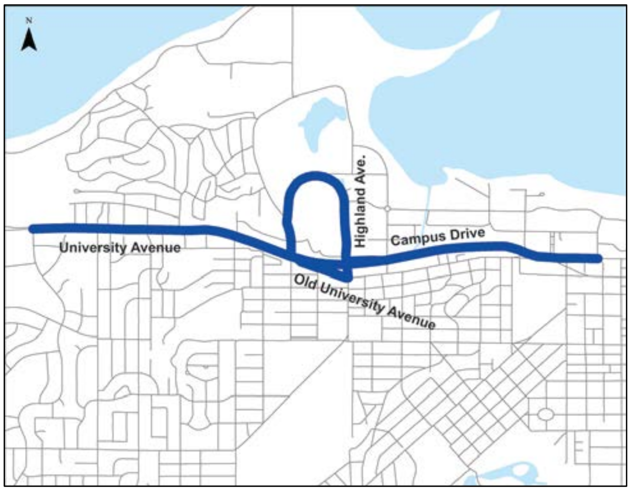


Alternative F-3

Employment:	High
Ridership:	5,799
Population:	High
TOD Potential:	Low
Roadway Suitability:	Medium

Description:

This route runs along Campus Drive, and provides direct service to the UW Hospital and Clinics by looping around University Bay Dr. counter-clockwise in both directions.

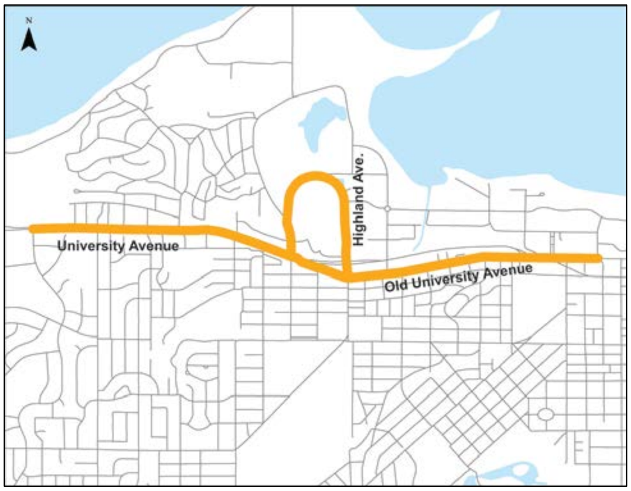


Alternative F-4

Employment:	High
Ridership:	5,426
Population:	High
TOD Potential:	Low
Roadway Suitability:	Low

Description:

This route runs along Old University Ave. and provides direct service to the UW Hospital and Clinics by looping around University Bay Dr. in both directions similar to Route 2.

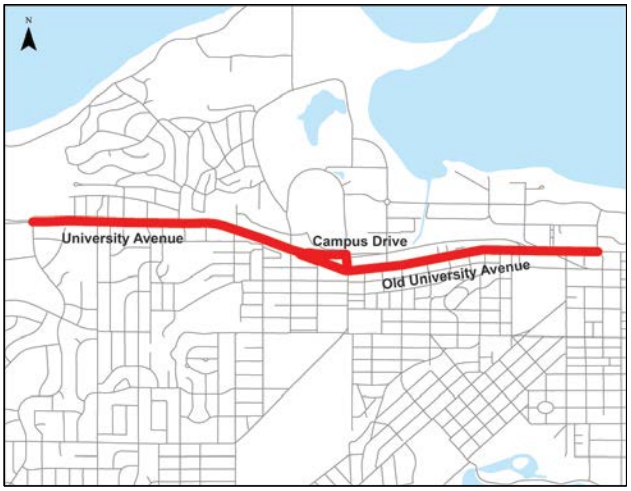


Alternative F-5

Employment:	High
Ridership:	4,097
Population:	High
TOD Potential:	Low
Roadway Suitability:	Low

Description:

This route runs along Old University Ave., but does not provide direct services to the University Hospital and Clinics.



Segment F Discussion

All options in Segment F require a tradeoff between speed and access. Alternative F-1 offers the fastest service but requires passengers to walk farther to the UW and VA Hospitals and does not serve Old University Ave. Alternatives F-3, F-4, and F-5 offer more access but would likely not live up to the goal of providing faster service; Route 2 currently provides the longest travel time between the Capitol Square and West Transfer Point for existing bus service. However, these alternatives have been retained for more detailed analysis because of the employment and residential areas they serve. Alternative F-2 offers direct access to the University of Wisconsin campus and the University Hospital and Clinics, but would have a very low operation speed and excessive passenger volumes circulating within the UW campus would put constraints on the line. **Alternatives F-1, F-3 and F-4 are identified as the most promising alignments within Segment F to advance for fine tuning.**

Table 11: Segment F Rating Overview

Segment F	**F1**	**F2**	**F3**	**F4**	**F5**
Employment	HIGH	HIGH	HIGH	HIGH	HIGH
Ridership	2,910	8,215	5,799	5,426	4,097
Population	HIGH	HIGH	HIGH	HIGH	HIGH
TOD Potential	LOW	LOW	LOW	LOW	LOW
Roadway Suitability	MEDIUM	LOW	MEDIUM	LOW	LOW
	Most Promising		**Most Promising**	**Most Promising**	

Segment G Alternatives

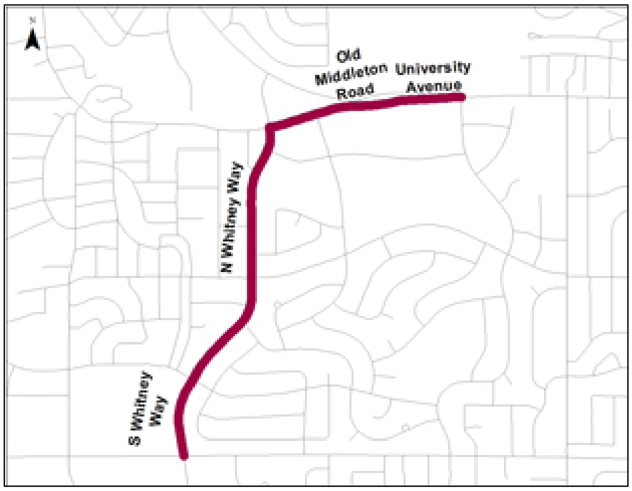
This segment continues south of Segment G from Segoe Road to Whitney Way & Mineral Point Road.

Alternative G-1

Employment:	Medium
Ridership:	222
Population:	Low
TOD Potential:	Low
Roadway Suitability:	Medium

Description:

This routing continues west along University Avenue to Old Middleton Road and turns south on Whitney Way.

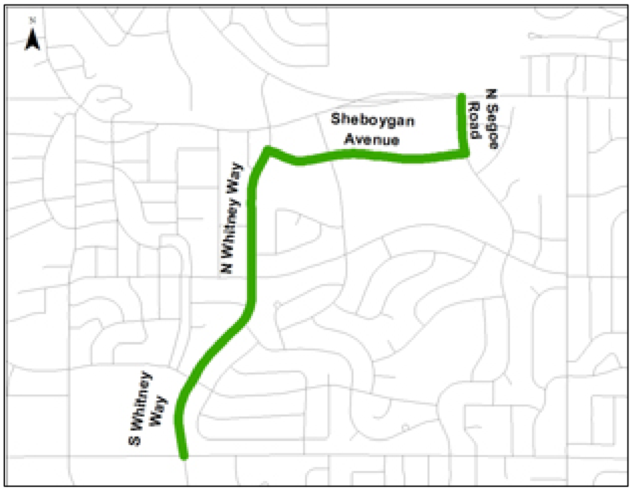


Alternative G-2

Employment:	Medium
Ridership:	1,432
Population:	High
TOD Potential:	Medium
Roadway Suitability:	Medium

Description:

This routing follows Segoe south to Sheboygan Ave. before turning south on to Whitney Way.

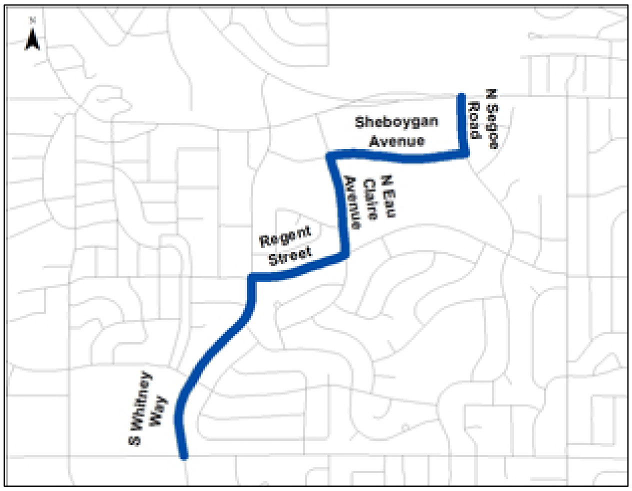


Alternative G-3

Employment:	Medium
Ridership:	1,508
Population:	High
TOD Potential:	Medium
Roadway Suitability:	Low

Description:

This routing follows a more complicated path from Segoe Rd. to Sheboygan Ave. to Eau Claire Ave. to Regent St. to Whitney Way. Many existing routes follow this pattern because of the unsignalized left turn at Sheboygan Ave. and Whitney Way.



Segment G Discussion

Within Segment G, deviating from University Avenue to serve Sheboygan Ave. provides more direct access to the population concentrations and Hill Farms State Office Building, an important potential TOD site, in that area, but increases travel times slightly. Transitioning from the current alignment for most service (G-3) to G-2 would likely require some changes at the intersection of Sheboygan Ave. and Whitney Way. Alternative G-1 has the least operational challenges and highest speed. **Alternatives G-1 and G-2 are identified as the most promising alignments within Segment G to advance for fine tuning.**

Table 12: Segment G Rating Overview

Segment G	G1	G2	G3
Employment	MEDIUM	MEDIUM	MEDIUM
Ridership	222	1,432	1,508
Population	LOW	HIGH	HIGH
TOD Potential	LOW	MEDIUM	MEDIUM
Roadway Suitability	MEDIUM	MEDIUM	LOW
	Most Promising	**Most Promising**	

Segment H Alternatives

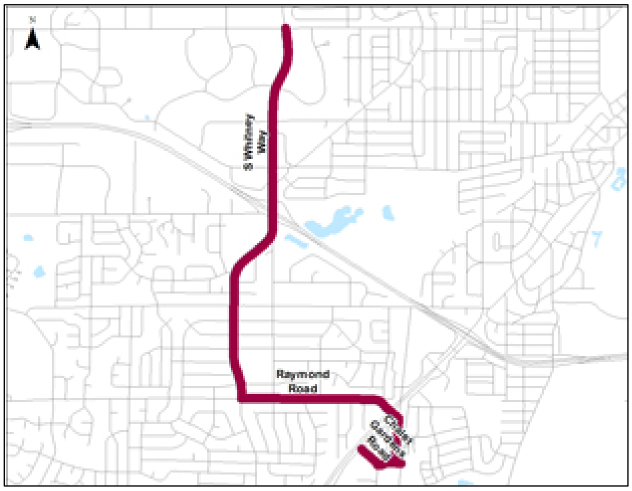
This segment continues south of Segment G from Whitney Way & Mineral Point Road to a potential terminus in the Allied/Dunn's Marsh Neighborhood instead of serving the West Towne area.

Alternative H-1

Employment:	Medium
Ridership:	463
Population:	Medium
TOD Potential:	Medium
Roadway Suitability:	Low

Description:

This routing travels south from Mineral Point Road along Whitney Way and Raymond Road. A new connection from Raymond Rd. to Allied Dr. would be required to make this alternative work.

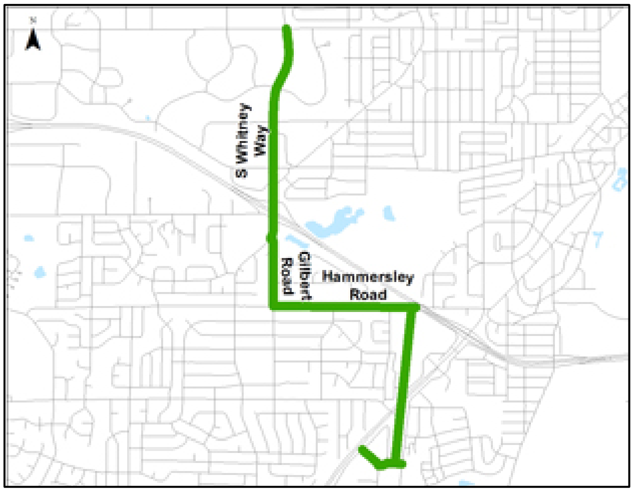


Alternative H-2

Employment:	Medium
Ridership:	428
Population:	Medium
TOD Potential:	Medium
Roadway Suitability:	Low

Description:

This routing travels south from Mineral Point Road along Whitney Way and Hammersley Road to the Southwest Commuter path. A new busway from Hammersley Rd. to Allied Dr. adjacent to the Southwest Commuter Path would be required to make this alternative work.



Segment H Discussion

At this point in the study it has been determined that the West Corridor connections between population, employment and destinations will be better served with a terminus near the West Towne area, so no further evaluation of this segment will be conducted.

Segment I Alternatives

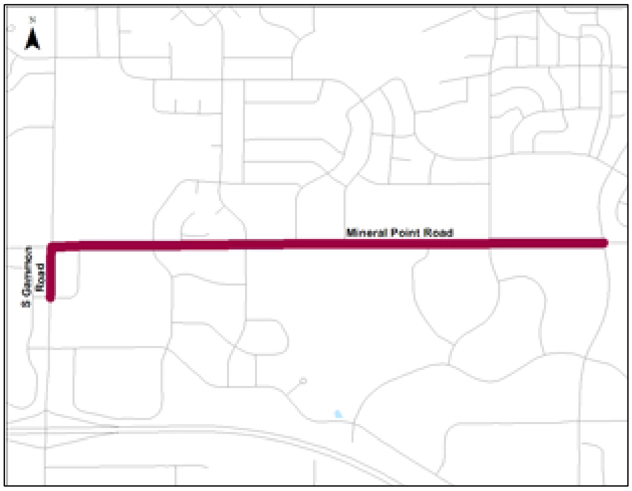
This segment continues west of Segment G from Whitney Way & Mineral Point Road to West Towne Mall.

Alternative I-1

Employment:	High
Ridership:	341
Population:	Medium
TOD Potential:	Medium
Roadway Suitability:	High

Description:

This routing provides the fastest and most direct option by operating completely on Mineral Point Rd. and ending at the West Towne Mall. The bus, bicycle, and right turn-only lanes on Mineral Point Rd. would be utilized. It assumes that the West Transfer Point would be relocated to be served by this Route.

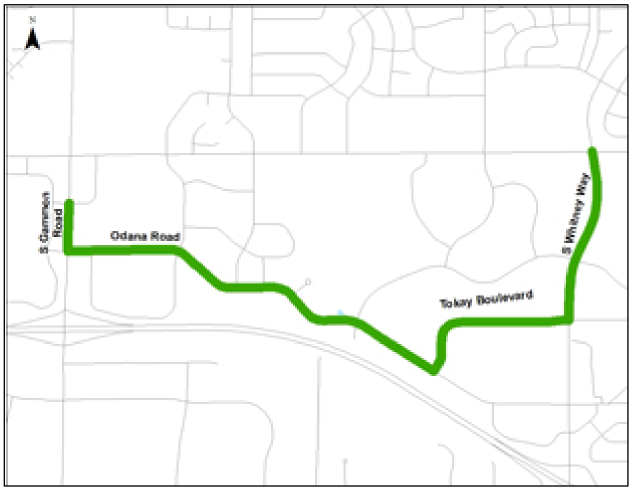


Alternative I-2

Employment:	Medium
Ridership:	416
Population:	Low
TOD Potential:	Medium
Roadway Suitability:	Low

Description:

This routing takes a more circuitous path along Whitney Way, Tokay Blvd. and Odana Rd. However, it serves Westgate, a significant potential TOD site, and does not require the relocation of the West Transfer Point.



Segment I Discussion

Like other competitive alternatives within the study area, the choice between I-1 and I-2 requires a tradeoff between speed and access. The existing transit lanes on Mineral Point Road and direct routing make Alternative I-1 appealing regarding speed. However, many of the land uses along this road, as well as characteristics such as building setbacks, make pedestrian access to transit in this corridor more difficult. The feasibility of relocating the West Transfer Point needs to be explored further. Additionally, if I-1 were chosen and extended west of Gammon Rd., direct service to West Towne Mall would no longer be provided. **Both Alternatives I-1 and I-2 are noted as promising alignments within Segment I and will be advanced for further refinement.**

Segment J Alternatives

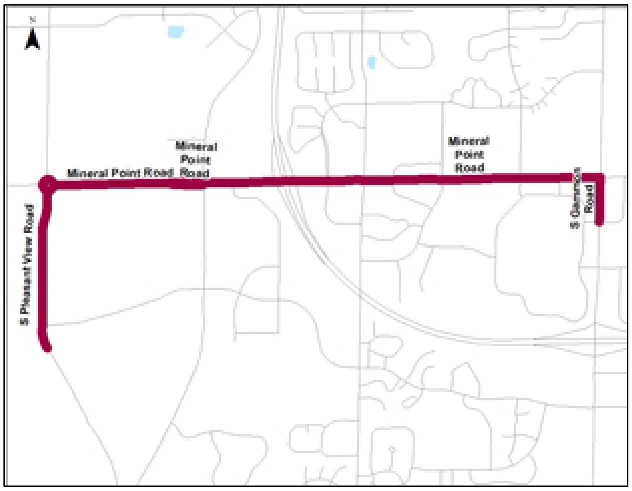
This segment continues west of Segment I from West Towne Mall to the planned University Research Park Phase II Development near Mineral Point Road and Pleasant View Road.

Alternative J-1

Employment: Medium
Ridership: 213
Population: Low
TOD Potential: Medium
Roadway Suitability: High

Description:

This routing operates between West Towne Mall and the University Research Park planned Phase II development on Mineral Point Road. The routing is direct, although the Beltline Highway crossing may result in delays.

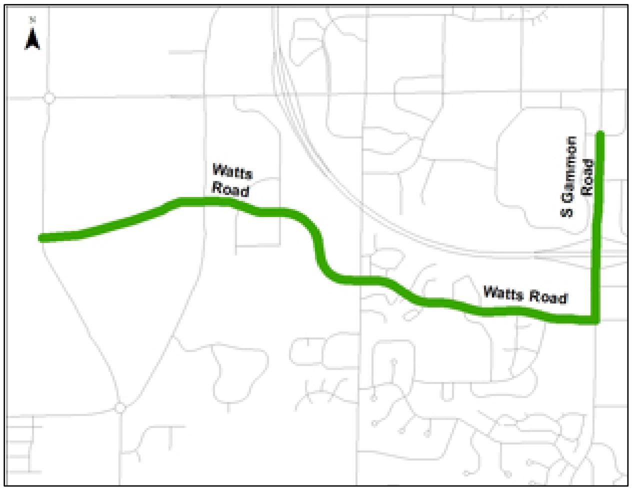


Alternative J-2

Employment: Medium
Ridership: 355
Population: Medium
TOD Potential: Medium
Roadway Suitability: Low

Description:

This routing operates on Gammon Road and Watts Road to the planned University Research Park Phase II development. It serves residential and retail areas but has a circuitous routing.



Segment J Discussion

Given that Phase II of the University Research Park has not yet been completed, the study will evaluate the West Corridor with a terminal at West Towne mall. Further evaluation of Segment J west of the beltline will be deferred until development expands in that area.

Madison Area Transportation Planning Board – An MPO

Madison Transit Corridor Study

A Project of the Capital Region Sustainable Communities Partnership

Appendix A

Screened Alternative Routing

These alignment alternatives were considered for possible inclusion into the BRT study. They were removed during the screening process so that the Bus Rapid Transit study could analyze the strongest corridors in more detail. Some alternatives have been removed in favor of more alternate routings that were clearly superior, others were identified as potential future extensions of future routes.

Middleton

Routing	University Avenue to Middleton Transfer Point via University Avenue
Advantages	Connects two major municipalities
Reasons for Removal	Low existing transit ridership compared to other west side alternatives Does not serve major residential areas in north Middleton Competes with planned commuter rail line
Future Development	Consider as a future BRT line Consider improvements to existing service (Routes 70, 71, 72, and 74)

West Madison / Middleton

Routing	Middleton to West Towne via Pleasant View Road or via Deming Way and Junction Road
Advantages	Serves major employment centers
Reasons for Removal	Low existing transit ridership Circuitous roadway network Low redevelopment potential
Future Development	Consider improvements to existing service (Routes 15, 73, and 74)

University Research Park Phase II

Routing	West Towne to Pleasant View Road and Watts Road via Mineral Point Road
Advantages	Serves a planned transit-oriented employment center
Reasons for Removal	The current study is focusing on already developed areas
Future Development	Consider as a future BRT extension

Hilldale Mall

Routing	University Avenue to Sheboygan Avenue via Midvale Boulevard, Heather Crest, Kelab Drive, and Segoe Road
Advantages	Serves Hilldale Mall and residential areas on Midvale Boulevard
Reasons for Removal	Circuitous roadway network
Future Development	Maintain local service to the interior of the Hilldale Mall Consider pedestrian improvements from University Avenue to Hilldale Mall

Midvale Boulevard

Routing	University Avenue to Allied / Dunn's Marsh via Segoe Road, Kelab Drive / Vernon Boulevard / Regent Street, Midvale Boulevard, Verona Road
Advantages	Serves Allied / Dunn's Marsh neighborhood and Midvale Boulevard
Reasons for Removal	Reduces service to Hill Farms and West Towne Most land uses are not supportive of transit Competes with crossing transit service (Routes 3/7, 6, 14, 18, and 19)
Future Development	Consider improvements to existing service

Monroe Street

Routing	Central Madison to Westgate via Monroe Street and Odana Road or Tokay Boulevard, or to Allied / Dunn's Marsh via Monroe Street and Verona Road
Advantages	Serves Monroe Neighborhood
Reasons for Removal	Transit ridership is not competitive with University Avenue corridor Travel time improvements would be difficult to improve with traffic volumes and lane configurations on Monroe Street
Future Development	Consider as a future BRT line

Southwest Commuter Path

Routing	Central Madison to Westgate via former Illinois Central Gulf Railroad corridor shared with bicycle path and Odana Road or Tokay Boulevard
Advantages	Provides low travel times to west Madison separated from traffic
Reasons for Removal	Land uses are not supportive of transit Engineering challenges and impacts to bicycle users are uncertain Does not alleviate overcrowding problems in the University Avenue corridor or serve the Monroe Street corridor
Future Development	None

University Avenue Counter-Flow Lane

Routing	Eastbound from Campus Drive to Bassett Street via University Avenue (this configuration existed until about 1980 when it was converted to a bicycle lane)
Advantages	Provides a dedicated transit-only facility separated from traffic
Reasons for Removal	Impacts to bicyclists would be very high Bicycle use of the facility would likely continue, resulting in operational problems for transit Buses would not be able to pass bicyclists or other buses Engineering constraints related to the lane width are unknown
Future Development	None

Nine Springs Neighborhood

Routing	South Park Street to Nine Springs Neighborhood via USH-14, former Chicago and Northwestern Railroad corridor, Syene Road, or East Cheryl Parkway
Advantages	Serves a planned major transit-oriented employment center
Reasons for Removal	The current study is focusing on already developed areas
Future Development	Consider as a future BRT line or extension

Stewart Street

Routing	South Park Street to Fish Hatchery Road via a new Beltline Highway crossing at Perry Street or Longitude -89.400 and Stewart Street
Advantages	Serves a major employment center and potential future development area Eliminates congested Beltline Highway crossing at Fish Hatchery Road Provides a connection from South Park Street to Syene Road
Reasons for Removal	The potential Perry Street overpass is uncertain Does not serve transit dependant areas along Badger Road
Future Development	Consider as a future change or extension if the Perry Street overpass is completed and/or Nine Springs Neighborhood is developed

West Washington Avenue

Routing	Park Street to Capitol Square via West Washington Avenue University Avenue / Johnson Street to Capitol Square via Broom / Bassett Streets and West Washington Avenue
Advantages	Provides faster, more direct routing compared to Park Street, University Avenue / Johnson Street, and State Street Potentially serves a future intercity bus and/or rail terminal Improves reliability and potentially eliminates some detours by eliminating routing on State Street
Reasons for	Does not serve the UW campus or State Street, major regional destinations

Removal	The site of the future intercity bus/rail terminal is uncertain Most detours in the Madison CBD are related to the Capitol Square
Future Development	Maintain local service Consider improvements to existing service connecting the Bassett Neighborhood to the UW campus (Routes 1, 10, 19, and 38)

Lower State Street

Routing	University Avenue / Johnson Street to the Capitol Square via Lake Street and State Street
Advantages	Serves cultural activities along Lower State Street (400, 500, and 600 blocks)
Reasons for Removal	Long, unpredictable travel times caused by turns, traffic signals, high-volume pedestrian crossings, and other blockages
Future Development	Maintain local service (Routes 4 and 6)

Capitol Loop

Routing	State Street to East Washington Avenue via Fairchild, Doty, and Webster Streets eastbound and via Webster and Dayton Streets westbound
Advantages	Eliminates most detours related to the Capitol Square
Reasons for Removal	The Capitol Loop has high traffic volumes, narrower sidewalks, and is not as pedestrian friendly as the Capitol Square Four block separation between eastbound and westbound buses is high, access between the area south of the Capitol and westbound buses would be compromised All local service would need to use the Capitol Loop to accommodate transfers
Future Development	Will likely be the detour route during major detours Develop strategies to reduce the scale and number of Capitol Square detours and improve information during detours Consider improvements to passenger facilities

East Rail Corridor

Routing	Capitol Square to Winnebago Street or East Washington Avenue via Wilson Street and the East Rail Corridor (former Chicago and Northwestern Railroad and Milwaukee Road)
Advantages	Provides reliable travel to north and east Madison separated from traffic
Reasons for Removal	The one-mile busway does not provide a travel time advantage over other corridors because of turns and traffic signals needed to enter and exit it Impacts to bicycle users and future rail plans are uncertain Competes with parallel service on Jenifer Street and East Washington Avenue
Future Development	None

East Madison and Monona

Routing	Capitol Square to Broadway via Atwood Avenue and Monona Drive or USH-51
Advantages	Extends BRT service to east Madison and Monona, including Dutch Mill
Reasons for Removal	Most land uses are unsupportive of transit
Future Development	Consider as a future BRT line Consider improvements to existing service (Routes 11, 12, 16, and 39)

International Lane

Routing	Packers Avenue to Dane County Regional Airport via International Lane
Advantages	Provides faster, more direct routing
Reasons for Removal	Most land uses are not supportive of transit The deviation to Darwin Road serves a substantial residential area with little additional travel time Existing and potential transit ridership at Dane County Regional Airport alone is not sufficient to sustain BRT service levels
Future Development	Maintain appropriate local service to the employment area along International Lane (Existing Route 20)

Aberg Avenue / Anderson Street

Routing	East Washington Avenue to Dane County Regional Airport via Aberg Avenue and Packers Avenue or Anderson Street and International Lane
Advantages	Increases service to East Washington Avenue Provides fast, reliable service to Dane County Regional Airport
Reasons for Removal	Travel times are not substantially lower than routing via Sherman Avenue or Packers Avenue Does not serve high-ridership areas near Fordem Avenue and Warner Park or identified TOD areas along Sherman Avenue Provides fewer opportunities to serve the North Transfer Point The routing is duplicative of the northeast Corridor
Future Development	Maintain existing service (Routes 17 and 20)

Hayes Road

Routing	East Towne to Hayes Road via East Washington Avenue Frontage Road
Advantages	Serves residential area near Hayes Road currently served by Route 6
Reasons for Removal	Ridership levels are not supportive of BRT service levels Limited opportunities for extensions to the northeast
Future Development	Restructure existing service to provide convenient connections at East Towne and the North Transfer Point

High Crossing

Routing	East Towne to High Crossing Boulevard via East Towne Boulevard and East Springs Boulevard
Advantages	Extends BRT service to established retail and residential areas with potential for future urban development
Reasons for Removal	Ridership levels are not supportive of BRT service levels
Future Development	Consider as a future BRT extension

Madison BRT Transit Corridor Study
Proposed BRT Travel Time Estimation Approach

This paper presents proposed methodology and estimates of bus rapid transit (BRT) travel times for use in the Madison BRT Transit Corridor Study. The objective is to develop reasonable estimates of BRT travel times, for use in travel demand modeling/ridership forecasts, fleet sizing and estimating daily and annual revenue bus-hours of service, for use in O&M cot estimation. Travel time components include:

- Time when the bus is in-motion, both in free flow and congested conditions;
- Time when the bus is stopped at a bus station to pick-up and drop-off passengers; and
- Time when the bus is stopped at traffic signals.

Proposed assumptions for each of these components are described in the following sections of this paper.

In-Motion Bus Times

In-motion bus time is a function of acceleration and deceleration from and to a stopped condition, and the average operating speed between accelerating and decelerating and driving distance, and traffic congestion. Acceleration and deceleration rates vary depending on the type of vehicle. Research literature suggests that acceleration rates typically are 2.0 to 2.5 mphps (decreasing when accelerating to speeds above 20 mph) and deceleration rates are typically 2.0 mphps. Acceleration rates for articulated buses are less than for standard 40' buses, and hybrid buses tend to have higher acceleration rates than diesel buses. Since vehicle type is yet undefined in this feasibility study, it is proposed that a 2.0 mphps acceleration rate be used (gradually decreasing to 1.25 mphps when accelerating to 40 mph), and a constant 2.0 mphps deceleration be used.

It is proposed that existing posted speed limits be used as the maximum allowable speed between stations. Table 1 presents posted speeds on road segments proposed for BRT service.

Maximum assumed operating speeds have been reduced in areas where there is known to be high levels of congestion. (e.g., University Avenue/Park Street area). Table 2 identifies areas where speeds lower than the posted speed limit have been assumed due to congestion. It is important to note that the calculated *average* speed between stations will be much lower than the maximum speed assumptions shown in Tables 1 and 2, once traffic signal delay and bus stops are taken into account.

Table 1
Posted Speed Limits on Proposed BRT Road Segments

Corridor	Street	From/To	Posted Speed (mph)
Central	Gorham/Johnson St.	State St. to Bassett St.	25
	Univ./Johnson St.	Bassett St. to Park St.	25
	State Street	Gorham/Johnson St. to Capitol Sq.	unknown
	Washiington Ave.	Capitol Sq. to Baldwin St.	35
East	Washington Ave.	Baldwin St. to Wright St.	35
	Wright St.	Washington Ave. to Anderson St.	25
	Anderson St.	Wright St. to Sloughton Rd.	35
	Sloughton Rd.	Anderson St. to Washington Ave.	35
	Washington Ave.	Sloughten St. to East Towne Mall	45
West	University/Johnson St.	Park St. to Campus Dr.	25
	Campus Dr.	University Ave. to University Ave.	40
	University Ave.	Campus Dr. to Segoe Rd.	35
	Segoe Rd.	University Ave. to Sheboygan Ave.	30
	Sheboygan Ave.	Segoe Rd. to Whitney Way	30
	Whitney Way	Sheboygan Ave. to Mineral Point Rd.	30
	Mineral Point Rd.	Whiney Way to High Point Road	40
	Alt. Odana Rd. Alignment		
	Whitney Way	Mineral Point Rd. to Tokay Blvd.	35
	Tokay Blvd.	Whitney Way to Odana Rd.	30
	Odana Rd.	Tokay Blvd. to Gammon Rd.	30
	Gammon Rd.	Odana Rd. to West Towne Mall	35
North	Washington Ave.	Baldwin St. to First St.	35
	Fordem Ave.	Johnson St. to Sherman Ave.	30
	Sherman Ave.	Fordem Ave. to Northport Dr.	30
South	Park St.	University Ave. to Regent St.	25
	Park St.	Regent St. to Badger Road	30
	Badger Rd.	Park St. to Fish Hatchery Rd.	30
	Fish Hatchery Rd.	Badger Rd. to Post Rd.	30
	Fish Hatchery Rd.	Post Rd. to Caddis Bend	40

Table 2
BRT Road Segments With Reduced Max. Speed Assumptions

Corridor	Roadway	Segment	Reduced Speed
Central	Washington Ave.	Capitol Sq. to Webster St.	10 mph
	Washington Ave.	Webster St. to Blair St.	25 mph
	State Street/Gorham St.	Capitol Sq. to Bassett St.	10 mph
	University Ave.	Bassett Street to Park St.	20 mph
South	Park Street	Univ. Ave. to Regent St.	25 mph
East	Anderson St.	Wright St. to Stoughton Rd.	25 mph
West	Mineral Pt. Road	Yellow Stone Dr. to Westfield Rd.	30 mph
West (Alt. Alignment)	Odana Road	Grand Canyon Dr. to West Towne Mall	25 mph

Bus Stop Dwell Times

The time spent at each stop is dependent on characteristics such as:

- The number of passengers boarding and alighting
- The number of doors available for boarding and alighting
- Passenger volumes inside the bus
- Fare collection method (i.e., on-board or off-board)
- ADA/wheelchair and bicycle boardings and alightings and procedures to accommodate them (e.g., kneeling, ramp deployment, securement procedures inside the bus, exterior bike racks)
- Proportion of trips that pass the stop without stopping

Although some lower use stops may be passed without stopping, travel time estimates for this study will assume buses come to a complete stop at each designated BRT station/stop. Off-board fare collection is assumed, thus allowing for the use of both bus doors for boarding activity and a uniform dwell time regardless of projected boardings, except for very high use stops.

It is recommended that stations be classified as “moderate” vs. “high” ridership activity, and that typical ridership activity stations are assigned an average station dwell of 15 seconds, and high ridership activity stations are assigned an average station dwell of 30 seconds. Although actual dwell times can sometimes be lower, these values provide some allowance for the potential presence of bicycle users, ramp deployments, and other unpredictable events. It is also proposed that stops at existing or proposed relocated transfer points are assigned a higher dwell time. Additional dwell time assumptions are as follows:

- One-minute dwells have been proposed at the relocated North Transfer Point at Aberg for the North Corridor Alignment
- One-minute dwells are proposed at the East Towne Mall Station for the East Corridor Alignment

- Two-minute dwells are proposed at the South Transfer Point for the South Corridor Alignment (to allow some time for buses to turn into/out of the transit center)
- Two-minute dwells are proposed at the West Transfer Point for the West Corridor Alignment – Odana Road alternative (to allow some time for buses to turn into/out of the transit center)
- Two-minute dwells are also assumed at Mineral Point Road Station for the West Corridor Alignment – Mineral Point Road alternative. It is assumed the West Transfer Point is relocated to this location under this scenario.

Table 3 presents a list of proposed BRT stops and proposed station classifications for each proposed corridor. Stations in Table 3 that have been assigned 30-second station dwells are at locations where there is a nearby major trip generator.

Table 3
BRT Station/Stop Designations and Dwell Times

Corridor	Station ID	Station Name	Station Class.	Station Dwell
Central	C400w	Park Street	High	0:00:30
	C300w	Bassett Street	High	0:00:30
	C200w	State Street	High	0:00:30
	C100	Capitol Square	High	0:00:30
	C200e	Webster Street	Moderate	0:00:15
	C300e	Blair Street	Moderate	0:00:15
	C400e	Paterson Street	Moderate	0:00:15
	C500e	Baldwin Street	Moderate	0:00:15
East	E100	First Street	Moderate	0:00:15
	E200	Fourth Street	High	0:00:30
	E300	Milwaukee Street	Moderate	0:00:15
	E400	Starkweather Creek	Moderate	0:00:15
	E500	Melvin Court	Moderate	0:00:15
	E600	Wright Street	Moderate	0:00:15
	E700	Madison College	High	0:00:30
	E800	Mendota Street	Moderate	0:00:15
	E900	Thierer Road	Moderate	0:00:15
	E1000	East Towne Mall	High	0:01:00
West	W100	Mills/Charter Street	High	0:00:30
	W200	Randall Avenue	High	0:00:30
	W300	Farley Avenue	Moderate	0:00:15
	W400	Shorewood Boulevard	Moderate	0:00:15
	W500	Midvale Boulevard	Moderate	0:00:15
	W600	Sheboygan Avenue	Moderate	0:00:15
	W700	Eau Claire Avenue	Moderate	0:00:15
	W800	Regent Street	Moderate	0:00:15
	W900a	Mineral Point Road (MPR align)	High	0:02:00
	W900b	Mineral Point Rod (Odana Rd align)	Moderate	0:00:15
	W1000	Rosa Road	Moderate	0:00:15
	W1100	Yellow Stone Drive	Moderate	0:00:15
	W1200	Westfield Road	High	0:00:30
	W1300	High Point	High	0:00:30
	W1000A	*West Transfer Point*	*High*	0:02:00
	W1100A	*Research Park Boulevard*	*Moderate*	0:00:15
	W1200A	*Grand Canyon Drive*	*Moderate*	0:00:15
	W1300A	*West Towne Mall*	*High*	0:00:30
North	N100	Sherman Terrace	Moderate	0:00:15
	N200	Commercial Avenue	Moderate	0:00:15
	N300	Aberg	High	0:01:00
	N400	Vahlen Street	Moderate	0:00:15
	N500	Trailsway	Moderate	0:00:15
	N600	Warner Park	High	0:00:30
South	S100	Regent Street	Moderate	0:00:15
	S200	W. Washington Avenue	Moderate	0:00:15
	S300	Erin Street	Moderate	0:00:15
	S400	W. Olin Avenue	Moderate	0:00:15
	S500	Wingra Creek	Moderate	0:00:15
	S600	Bram Street	Moderate	0:00:15
	S700	Villager Mall	Moderate	0:00:15
	S800	South Transfer Point	High	0:02:00
	S900	Badger Road	Moderate	0:00:15
	S1000	Greenway Cross	Moderate	0:00:15
	S1100	Post Road	Moderate	0:00:15
	S1200	Caddis Bend	Moderate	0:00:15

Stations highlighted reflect alternative West Corridor alignment that is under consideration.

Traffic Signal Delay

The next component of BRT travel times is time spent in a stop condition at traffic signals. Traffic signal delay will vary considerably, for characteristics such as cycle time, phasing and signal progression will influence the probability that a bus arrives at a signal during the red phase of the cycle. Locations and length of delay will also vary by bus trip. Since this is a feasibility study, it is appropriate to define global assumptions regarding traffic signal characteristics, to calculate an *average* delay for each signalized intersection (recognizing that buses will not incur this delay at each signalized intersection).

The City of Madison Traffic Engineering Division provided cycle length information for each signalized intersection along the proposed BRT corridors, shown in Table 3. Actual cycle lengths in the p.m. peak period typically range from 80 to 110 seconds, with a majority of signals exhibiting a 90 second cycle length. For signals where there is a range in potential cycle length, the maximum length has been used. For signals where there is no specified cycle length, a 90 second cycle time has been assumed, with the exception of Stoughton Road and Anderson Street, where a 120 second cycle time has been used.

The Traffic Engineering Division also provided typical green time splits for the major arterial through movement for select intersections. Green time splits typically ranged from 70 to 80 percent for the through movements. Green time splits around Capitol Square, however, were much less. In addition, there are several locations along proposed BRT alignments where buses will be turning left onto other streets, resulting in additional delay time for the bus. For purposes of this feasibility study, typical green time assumptions, as a percentage of the cycle time, are as follows:

- Arterial through movements – 75%
- Downtown and University area – 50%
- Non-downtown right turn movements – 75%
- Non-downtown left turn movements – 25%

The next element in calculating traffic signal delay is consideration for transit signal prioritization (TSP). The Traffic Engineering Division has indicated that pedestrian timing provided for crossing the major street exceeds the programmed side street splits, and therefore, it may not be possible to provide TSP at many intersections. For purposes of this study, TSP has only been assumed at signalized intersections in suburban areas, where the volume of pedestrian crossings are likely to be low. Areas designated as outlying areas with potential for TSP along each alignment are as follows:

- East Corridor – east of First Street, but not including intersections near Madison College
- West Corridor – south/west of Sheboygan Avenue/Whitney Way
- North Corridor – North of Johnson Street
- South Corridor – South of Badger Road/Fish Hatchery Road

A 10 percent extension of green time has been assumed at those intersections where TSP has been assumed. This results in an extra 7 seconds of green time for a 90 second cycle with 75% green time for the arterial through movement.

Finally, consideration was given to signal progression. This has been expressed as the probability that a bus is stopped at a signalized intersection. For arterial through movements, a 25% stop probability has been assumed (i.e., a bus could be stopped for the full red phase of a cycle one of every four signalized intersections). For the downtown and University area, a 33% delay probability has been assumed. For intersections where the bus must make a left turn, a 50% delay probability has been assumed.

Buses are also required to stop at all railroad crossings. Travel time estimates take into account the time to decelerate to a complete stop, and then accelerate at each of the following railroad crossings:

Table 4 presents resulting calculations of average signal delay at each signalized intersection and railroad crossing along proposed BRT alignments. Some delay has also been assumed at stop signs. It is important to note that this table is intended to reflect reasonable assumptions of traffic signal delay along each BRT alignment, and not anticipated actual delay, and that assumptions such as intersections with TSP will require much further analysis.

Travel Time Results

Tables 5 through 9 present resulting travel time estimates for each of the four corridors, including portions of the Central Corridor from Capitol Square. The travel time estimates follow the methodology described in this paper, and are based on the following formula for each station-to-station segment:

Total Travel Time = bus time in motion (including acceleration and deceleration to the maximum defined speed) + traffic signal delay time + station dwell time

Travel time estimates have only been calculated for one direction (outbound from downtown Madison). Travel times for the reverse direction are assumed to be similar. Layover/recovery time will be included in bus cycle time calculations that will account for potential variations. Run time (in-motion time) ranges from 57 to 66 percent of total travel time for all corridors.

Travel time estimates shown in the following tables do not specifically account for potential travel time differences on alignment segments where mixed runningway conditions are proposed. For example, on Whitney Way and Mineral Point Road (West Corridor), there are two alternative alignment configurations still under consideration – side running and median busway. Similarly, segments of the south corridor’s proposed alignment include options of a side running vs. median busway configuration. A median busway configuration would separate bus traffic from general vehicular traffic, and thus provide more reliable bus travel times. It may also provide slightly faster bus travel times, depending on the level of congestion in the general traffic lanes.

Table 4
Traffic Signal Delay Calculations

	Seg.			Actual Cycle Lenths				% Green		Max.	Max.	Prob.	Avg.
Corridor	ID	Intersection		AM PK	Off Pk	PM Pk	USE	Time	TSP?	Green Time	Red Time	of Delay	Delay
Central	C20w	Mifflin St.	Wisconsin Ave.	80	65	80	0:01:20	50%	No	0:00:40	0:00:40	33%	0:00:13
	C20w	Mifflin St.	Carroll St./State St. (RT)	80	65	80	0:01:20	50%	No	0:00:40	0:00:40	33%	0:00:13
	C20w	State St.	W. Dayton St.	80	65	80	0:01:20	50%	No	0:00:40	0:00:40	33%	0:00:13
	C30w	State Street	Johnson St.	90/100	80	90/100	0:01:40	50%	No	0:00:50	0:00:50	33%	0:00:17
	C30w	State Street	Gorham St. (LT)	90/100	80	90/100	0:01:40	50%	No	0:00:50	0:00:50	33%	0:00:17
	C30w	Gorham St.	N. Broom St.	90/100	80	90/100	0:01:40	50%	No	0:00:50	0:00:50	33%	0:00:17
	C30w	University Ave.	N. Frances St.	90/100	80	90/100	0:01:40	50%	No	0:00:50	0:00:50	33%	0:00:17
	C40w	University Ave.	N. Lake St.	90/100	80	90/100	0:01:40	50%	No	0:00:50	0:00:50	33%	0:00:17
	C40w	University Ave.	Campus Mall	90/100	80	90/100	0:01:40	50%	No	0:00:50	0:00:50	33%	0:00:17
	C40w	University Ave.	Park St. (LT)	90/100	80	90/100	0:01:40	50%	No	0:00:50	0:00:50	33%	0:00:17
	C20e	Main Street	Martin Luther King Blvd., Jr.	80	65	80	0:01:20	50%	No	0:00:40	0:00:40	33%	0:00:13
	C20e	Main Street	Pinckney Street/King Street (LT)	80	65	80	0:01:20	50%	No	0:00:40	0:00:40	33%	0:00:13
	C20e	Picnkney St.	Washington Ave. (RT)	80	65	80	0:01:20	50%	No	0:00:40	0:00:40	33%	0:00:13
	C20e	Washington Ave.	Webster St.	80	65	80	0:01:20	50%	No	0:00:40	0:00:40	33%	0:00:13
	C30e	Washington Ave.	Blair St.	90/100	80	90/100	0:01:40	75%	No	0:01:15	0:00:25	25%	0:00:06
South	S50	University Ave.	Park St. (LT)	90/100	80	90/100	0:01:40	50%	No	0:00:50	0:00:50	33%	0:00:17
	S50	Park St.	W. Johnson St.	90/100	80	90/100	0:01:40	50%	No	0:00:50	0:00:50	33%	0:00:17
	S50	Park Street	W. Dayton St.	95	85	90	0:01:30	75%	No	0:01:07	0:00:23	25%	0:00:06
	S50	Park Street	Regent St.	95	85	90	0:01:30	75%	No	0:01:07	0:00:23	25%	0:00:06
	S60	Park Street	Braxton Place	95	85	90	0:01:30	75%	No	0:01:07	0:00:23	25%	0:00:06
	S60	Park Street	W. Washington Ave.	95	85	90	0:01:30	75%	No	0:01:07	0:00:23	25%	0:00:06
	S70	Park Street	Erin St.	95	85	90	0:01:30	75%	No	0:01:07	0:00:23	25%	0:00:06
	S80	Park Street	Fish Hatchery Road	95	85	90	0:01:30	75%	No	0:01:07	0:00:23	25%	0:00:06
	S80	Park Street	W. Olin Ave.	95	85	90	0:01:30	75%	No	0:01:07	0:00:23	25%	0:00:06
	S90	Park Street	W. Wingra Dr.	95	85	90	0:01:30	75%	No	0:01:07	0:00:23	25%	0:00:06
	S100	Park Street	Plaenert Dr.	95	85	90	0:01:30	75%	No	0:01:07	0:00:23	25%	0:00:06
	S100	Park Street	Railroad Crossing	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0:00:10
	S110	Park Street	Buick St.	95	85	90	0:01:30	75%	No	0:01:07	0:00:23	25%	0:00:06
	S120	Park Street	Hughes Place	95	85	90	0:01:30	75%	No	0:01:07	0:00:23	25%	0:00:06
	S120	Park Street	Badger Road (RT)	95	85	90	0:01:30	75%	No	0:01:07	0:00:23	25%	0:00:06
	S130	W. Badger Road	Fish Hatchery Road (LT)	90	80	90/100	0:01:40	25%	No	0:00:25	0:01:15	50%	0:00:38
	S140	Fish Hatchery Road	Ann St./Emil St.	90	80	90/100	0:01:40	75%	Yes	0:01:23	0:00:17	25%	0:00:04
	S140	Fish Hatchery Road	Beltline WB Ramps	90	80	90/100	0:01:40	75%	Yes	0:01:23	0:00:17	25%	0:00:04
	S140	Fish Hatchery Road	Beltline EB Ramps	90	80	90/100	0:01:40	75%	Yes	0:01:23	0:00:17	25%	0:00:04
	S140	Fish Hatchery Road	Greenway Cross	90	80	90/100	0:01:40	75%	Yes	0:01:23	0:00:17	25%	0:00:04
	S150	Fish Hatchery Road	Post Road	90	80	90/100	0:01:40	75%	Yes	0:01:23	0:00:17	25%	0:00:04
	S160	Fish Hatchery Road	High Ridge Trail (RT)	n/a	n/a	n/a	Stop	n/a	n/a	n/a	n/a	n/a	0:00:10
	S160	Cahill Main	Caddis Bend	n/a	n/a	n/a	Stop	n/a	n/a	n/a	n/a	n/a	0:00:10
	S160	Caddis Bend	Fish Hatchery Road (LT)	90	80	90/100	0:01:40	25%	Yes	0:00:28	0:01:13	50%	0:00:36

Table 4 (Continued)
Traffic Signal Delay Calculations

	Seg.			Actual Cycle Lenths				% Green		Max.	Max.	Prob.	Avg.
Corridor	ID	Intersection		AM PK	Off Pk	PM Pk	USE	Time	TSP?	Green Time	Red Time	of Delay	Delay
North	N20	Main Street	Martin Luther King Blvd., Jr.	80	65	80	0:01:20	50%	No	0:00:40	0:00:40	33%	0:00:13
	N20	Main Street	Pinckney Street/King Street (LT)	80	65	80	0:01:20	50%	No	0:00:40	0:00:40	33%	0:00:13
	N20	Pinckney St.	Washington Ave. (RT)	80	65	80	0:01:20	50%	No	0:00:40	0:00:40	33%	0:00:13
	N20	Washington Ave.	Webster St.	80	65	80	0:01:20	50%	No	0:00:40	0:00:40	33%	0:00:13
	N30	Washington Ave.	Blair St.	90/100	80	90/100	0:01:40	75%	No	0:01:15	0:00:25	25%	0:00:06
	N40	Washington Ave.	Paterson St.	90/100	80	90/100	0:01:40	75%	No	0:01:15	0:00:25	25%	0:00:06
	N50	Washington Ave.	Ingersoll St.	90/100	80	90/100	0:01:40	75%	No	0:01:15	0:00:25	25%	0:00:06
	N50	Washington Ave.	Baldwin St.	90/100	80	90/100	0:01:40	75%	No	0:01:15	0:00:25	25%	0:00:06
	N60	Washington Ave.	Busway Connection (LT)	60	60	60	0:01:40	25%	No	0:00:25	0:01:15	50%	0:00:38
	N60	Busway Connection	Johnson Street	60	60	60	0:01:40	50%	No	0:00:50	0:00:50	33%	0:00:17
	N70	Sherman Ave.	Commercial Ave.	FREE			0:01:30	70%	Yes	0:01:09	0:00:21	33%	0:00:07
	N80	Sherman Ave.	Railroad Crossing	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0:00:10
	N80	Sherman Ave.	Aberg Ave.	FREE			0:01:30	70%	Yes	0:01:09	0:00:21	33%	0:00:07
	N90	Sherman Ave.	Schlimgen Ave.	FREE			0:01:30	70%	Yes	0:01:09	0:00:21	33%	0:00:07
East	E20	Main Street	Martin Luther King Blvd., Jr.	80	65	80	0:01:20	50%	No	0:00:40	0:00:40	33%	0:00:13
	E20	Main Street	Pinckney Street/King Street (LT)	80	65	80	0:01:20	50%	No	0:00:40	0:00:40	33%	0:00:13
	E20	Pinckney St.	Washington Ave. (RT)	80	65	80	0:01:20	50%	No	0:00:40	0:00:40	33%	0:00:13
	E20	Washington Ave.	Webster St.	80	65	80	0:01:20	50%	No	0:00:40	0:00:40	33%	0:00:13
	E30	Washington Ave.	Blair St.	90/100	80	90/100	0:01:40	75%	No	0:01:15	0:00:25	25%	0:00:06
	E40	Washington Ave.	Paterson St.	90/100	80	90/100	0:01:40	75%	No	0:01:15	0:00:25	25%	0:00:06
	E50	Washington Ave.	Ingersoll St.	90/100	80	90/100	0:01:40	75%	No	0:01:15	0:00:25	25%	0:00:06
	E50	Washington Ave.	Baldwin St.	90/100	80	90/100	0:01:40	75%	No	0:01:15	0:00:25	25%	0:00:06
	E60	Washington Ave.	RR Crossing #1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0:00:10
	E60	Washington Ave.	RR Crossing #2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0:00:10
	E60	Washington Ave.	First Street	90/100	80	90/100	0:01:40	75%	No	0:01:15	0:00:25	25%	0:00:06
	E70	Washington Ave.	4th Street	90/100	80	90/100	0:01:40	75%	Yes	0:01:23	0:00:17	25%	0:00:04
	E80	Washington Ave.	North St./Milwaukee St.	90/100	80	90/100	0:01:40	75%	Yes	0:01:23	0:00:17	25%	0:00:04
	E90	Washington Ave.	Johnson St.	90/100	80	90/100	0:01:40	75%	Yes	0:01:23	0:00:17	25%	0:00:04
	E90	Washington Ave.	N. Marquette	90/100	80	90/100	0:01:40	75%	Yes	0:01:23	0:00:17	25%	0:00:04
	E100	Washington Ave.	Aberg Ave. SB Ramps	90/100	80	90/100	0:01:40	75%	Yes	0:01:23	0:00:17	25%	0:00:04
	E100	Washington Ave.	Aberg Ave. NB Ramps	90/100	80	90/100	0:01:40	75%	Yes	0:01:23	0:00:17	25%	0:00:04
	E120	Washington Ave.	Wright St. (LT)	90/100	80	90/100	0:01:40	25%	No	0:00:25	0:01:15	50%	0:00:38
	E120	Wright St.	Anderson St. (RT)	FREE			0:01:30	75%	No	0:01:07	0:00:23	25%	0:00:06
	E130	Anderson St.	Stoughton Road (RT)	FREE			0:02:00	75%	No	0:01:30	0:00:30	25%	0:00:08
	E130	Stoughton Road	Washington Ave. (LT)	FREE			0:01:30	25%	No	0:00:23	0:01:07	50%	0:00:34
	E130	Washington Ave.	Mendota St.	90	90	100	0:01:40	75%	Yes	0:01:23	0:00:17	25%	0:00:04
	E140	Washington Ave.	Lien Road	90	90	100	0:01:40	75%	Yes	0:01:23	0:00:17	25%	0:00:04
	E140	Washington Ave.	Thierer Road/Portage Road	90	90	100	0:01:40	75%	Yes	0:01:23	0:00:17	25%	0:00:04
	E150	Washington Ave.	Eagan Road (RT)	90	90	100	0:01:40	75%	Yes	0:01:23	0:00:17	25%	0:00:04
	E150	Eagan Road	E. Towne Blvd. (LT)	n/a	n/a	n/a	Stop	n/a	n/a	n/a	n/a	n/a	0:00:10

Table 4 (Continued)
Traffic Signal Delay Calculations

Corridor	Seg. ID	Intersection		Actual Cycle Lenths				% Green		Max.	Max.	Prob.	Avg.
				AM PK	Off Pk	PM Pk	USE	Time	TSP?	Green Time	Red Time	of Delay	Delay
West	W50	University Ave.	Park St.	90/100	80	90/100	0:01:40	50%	No	0:00:50	0:00:50	33%	0:00:17
	W50	University Ave.	N. Brooks St.	90/100	80	90/100	0:01:40	50%	No	0:00:50	0:00:50	33%	0:00:17
	W50	University Ave.	N. Mills St.	90/100	80	90/100	0:01:40	50%	No	0:00:50	0:00:50	33%	0:00:17
	W60	University Ave.	N. Charter St.	90/100	80	90/100	0:01:40	50%	No	0:00:50	0:00:50	33%	0:00:17
	W60	University Ave.	N. Orchard St.	90/100	80	90/100	0:01:40	50%	No	0:00:50	0:00:50	33%	0:00:17
	W70	University Ave.	N. Randall Ave.	90/100	80	90/100	0:01:40	50%	No	0:00:50	0:00:50	33%	0:00:17
	W70	University Ave.	RR Xing/Ped Xing	90/100	80	90/100	0:01:40	50%	No	0:00:50	0:00:50	33%	0:00:17
	W70	University Ave.	Campus Drive	90/100	80	90/100	0:01:40	50%	No	0:00:50	0:00:50	33%	0:00:17
	W80	University Ave.	Farley Ave.	100/115	85	100	0:01:40	75%	No	0:01:15	0:00:25	25%	0:00:06
	W80	University Ave.	Ridge Street	100/115	85	100	0:01:40	75%	No	0:01:15	0:00:25	25%	0:00:06
	W90	University Ave.	Shorewood Blvd.	100/115	85	100	0:01:40	75%	No	0:01:15	0:00:25	25%	0:00:06
	W100	University Ave.	Midvale Blvd.	100/115	85	100	0:01:40	75%	No	0:01:15	0:00:25	25%	0:00:06
	W100	University Ave.	Segoe Road (LT)	100/115	85	100	0:01:40	25%	No	0:00:25	0:01:15	50%	0:00:38
	W100	Segoe Road	Frey Road	100/115	85	100	0:01:40	75%	No	0:01:15	0:00:25	25%	0:00:06
	W100	Segoe Road	Sheboygan Ave. (future signal RT)	FREE			0:01:30	75%	No	0:01:07	0:00:23	25%	0:00:06
	W120	Sheboygan Ave.	Whitney Way (future signal LT)	FREE			0:01:30	25%	No	0:00:23	0:01:07	50%	0:00:34
	W120	Whitney Way	Regent St.	FREE			0:01:30	75%	Yes	0:01:14	0:00:16	25%	0:00:04
	W130	Whitney Way	Mineral Point Road (RT)	95	90	100	0:01:40	75%	Yes	0:01:23	0:00:17	25%	0:00:04
	W140	Mineral Point Road	Rosa Rd.	95	90	100	0:01:40	75%	Yes	0:01:23	0:00:17	25%	0:00:04
	W150	Mineral Point Road	Island Dr.	95	90	100	0:01:40	75%	Yes	0:01:23	0:00:17	25%	0:00:04
	W160	Mineral Point Road	Yellowstone Dr.(future signal)	95	90	100	0:01:40	75%	Yes	0:01:23	0:00:17	25%	0:00:04
	W160	Mineral Point Road	Grand Canyon Dr.	95	90	100	0:01:40	75%	Yes	0:01:23	0:00:17	25%	0:00:04
	W160	Mineral Point Road	Gammon Road	FREE			0:01:30	50%	Yes	0:00:49	0:00:41	33%	0:00:13
	W160	Mineral Point Road	Mall Entrance (LT)	n/a	n/a	n/a	Stop	n/a	n/a	n/a	n/a	n/a	0:00:30
	W170	Westfield Road	Mineral Point Road (LT)	95	90	100	0:01:40	25%	Yes	0:00:28	0:01:13	50%	0:00:36
	W170	Mineral Point Road	Randolph Drive	95	90	100	0:01:40	75%	Yes	0:01:23	0:00:17	25%	0:00:04
	W170	Gammon Road	High Point Road	95	90	100	0:01:40	75%	Yes	0:01:23	0:00:17	25%	0:00:04
West Odana Road Alignment	W140a	Whitney Way	Mineral Point Road	95	90	100	0:01:40	75%	Yes	0:01:23	0:00:17	25%	0:00:04
	W140a	Whitney Way	Tokay Blvd. (RT)	95	90	100	0:01:40	75%	Yes	0:01:23	0:00:17	25%	0:00:04
	W180a	Tokay Blvd.	Odana Road (RT)	95	90	100	0:01:40	75%	Yes	0:01:23	0:00:17	25%	0:00:04
	W180a	Odana Road	Research Park Blvd.	95	90	100	0:01:40	75%	Yes	0:01:23	0:00:17	25%	0:00:04
	W190a	Odana Road	Potomac Lane	95	90	100	0:01:40	75%	Yes	0:01:23	0:00:17	25%	0:00:04
	W200a	Odana Road	Grand Canyon Drive	95	90	100	0:01:40	75%	Yes	0:01:23	0:00:17	25%	0:00:04
	W200a	Odana Road	Gammon Road	95	90	100	0:01:40	50%	Yes	0:00:55	0:00:45	33%	0:00:15
	W200a	Odana Road	Mall Ring Road (RT)	n/a	n/a	n/a	Stop	n/a	n/a	n/a	n/a	n/a	0:00:10

Table 5
East Corridor Travel Time Estimate

Station	Max Spd. [mph]	Distance [mi]	Total Distance	Run Time (hr:min:sec)	Delay Time (hr:min:sec)	Dwell Time (hr:min:sec)	Total Time (hr:min:sec)
Capitol Square			0.00			0:00:00	0:00:00
	10	0.28		0:01:44	0:00:53		
Webster Street			0.28			0:00:15	0:02:52
	25	0.22		0:00:44	0:00:06		
Blair Street			0.50			0:00:15	0:03:57
	35	0.40		0:01:00	0:00:06		
Paterson Street			0.89			0:00:15	0:05:18
	35	0.50		0:01:10	0:00:12		
Baldwin Street			1.39			0:00:15	0:06:56
	35	0.46		0:01:06	0:00:26		
First Street			1.86			0:00:15	0:08:43
	35	0.38		0:00:58	0:00:04		
Fourth Street			2.24			0:00:30	0:10:15
	35	0.41		0:01:01	0:00:04		
Milwaukee Street			2.65			0:00:15	0:11:36
	35	0.46		0:01:06	0:00:09		
Starkweather Creek			3.11			0:00:15	0:13:06
	35	0.47		0:01:06	0:00:09		
Melvin Court			3.58			0:00:15	0:14:35
	35	0.37		0:00:57	0:00:00		
Wright Street			3.95			0:00:15	0:15:47
	25	0.49		0:01:23	0:00:43		
Madison College			4.44			0:00:30	0:18:23
	25	0.80		0:02:08	0:00:46		
Mendota Street			5.24			0:00:15	0:21:32
	40	0.47		0:01:04	0:00:09		
Thierer Road			5.70			0:00:15	0:23:00
	30	0.58		0:01:25	0:00:14		
East Towne Mall			6.28			0:01:00	0:25:39
Totals			6.28	0:16:52	0:04:02	0:04:45	0:25:39
						Avg. Speed (mph):	14.69

Table 6
North Corridor Travel Time Estimate

Station	Max Spd. [mph]	Distance [mi]	Total Distance	Run Time (hr:min:sec)	Delay Time (hr:min:sec)	Dwell Time (hr:min:sec)	Total Time (hr:min:sec)
Capitol Square			0.00			0:00:00	0:00:00
	10	0.28		0:01:44	0:00:53		
Webster Street			0.28			0:00:15	0:02:52
	25	0.22		0:00:44	0:00:06		
Blair Street			0.50			0:00:15	0:03:57
	35	0.40		0:01:00	0:00:06		
Paterson Street			0.89			0:00:15	0:05:18
	35	0.50		0:01:10	0:00:12		
Baldwin Street			1.39			0:00:15	0:06:56
	30	0.60		0:01:27	0:00:54		
Sherman Terrace			1.99			0:00:15	0:09:32
	30	0.79		0:01:50	0:00:07		
Commercial Avenue			2.78			0:00:15	0:11:44
	30	0.50		0:01:15	0:00:17		
Aberg			3.28			0:01:00	0:14:15
	30	0.55		0:01:21	0:00:07		
Vahlen Street			3.83			0:00:15	0:15:58
	30	0.27		0:00:48	0:00:00		
Trailsway			4.10			0:00:15	0:17:01
	30	0.21		0:00:40	0:00:00		
Warner Park			4.31			0:00:30	0:18:11
Totals			4.31	0:11:59	0:02:42	0:03:30	0:18:11
						Avg. Speed (mph):	14.22

Table 7
South Corridor Travel Time Estimate

Station	Max Spd. [mph]	Distance [mi]	Total Distance	Run Time (hr:min:sec)	Delay Time (hr:min:sec)	Dwell Time (hr:min:sec)	Total Time (hr:min:sec)
Capitol Square			0.00			0:00:00	0:00:00
	10	0.17		0:01:06	0:00:40		
State Street			0.17			0:00:30	0:02:16
	10	0.33		0:02:04	0:01:06		
Bassett Street			0.50			0:00:30	0:05:56
	20	0.36		0:01:15	0:00:50		
Park Street			0.86			0:00:30	0:08:30
	25	0.38		0:01:08	0:00:44		
Regent Street			1.24			0:00:15	0:10:37
	30	0.31		0:00:53	0:00:11		
W. Washington Avenue			1.55			0:00:15	0:11:57
	30	0.23		0:00:43	0:00:06		
Erin Street			1.78			0:00:15	0:13:00
	30	0.46		0:01:11	0:00:11		
W. Olin Avenue			2.24			0:00:15	0:14:37
	30	0.37		0:01:00	0:00:06		
Wingra Creek			2.61			0:00:15	0:15:58
	30	0.22		0:00:42	0:00:16		
Bram Street			2.83			0:00:15	0:17:11
	30	0.28		0:00:49	0:00:06		
Villager Mall			3.11			0:00:15	0:18:20
	25	0.25		0:00:49	0:00:11		
South Transfer Point			3.36			0:02:00	0:21:21
	30	0.45		0:01:09	0:00:38		
Badger Road			3.81			0:00:15	0:23:22
	30	0.58		0:01:25	0:00:17		
Greenway Cross			4.39			0:00:15	0:25:20
	30	0.39		0:01:02	0:00:04		
Post Road			4.78			0:00:15	0:26:41
	40	0.72		0:01:27	0:00:56		
Caddis Bend			5.50			0:00:15	0:29:19
Totals			5.50	0:16:43	0:06:21	0:06:15	0:29:19
						Avg. Speed (mph):	11.25

Table 8
West Corridor Travel Time Estimate – Mineral Point Road Alignment

Station	Max Spd. [mph]	Distance [mi]	Total Distance	Run Time (hr:min:sec)	Delay Time (hr:min:sec)	Dwell Time (hr:min:sec)	Total Time (hr:min:sec)
Capitol Square			0.00			0:00:00	0:00:00
	10	0.17		0:01:06	0:00:40		
State Street			0.17			0:00:30	0:02:16
	10	0.33		0:02:04	0:01:06		
Bassett Street			0.50			0:00:30	0:05:56
	20	0.36		0:01:15	0:00:50		
Park Street			0.86			0:00:30	0:08:30
	30	0.22		0:00:42	0:00:50		
Mills/Charter Street			1.08			0:00:30	0:10:32
	25	0.16		0:00:36	0:00:33		
Randall Avenue			1.24			0:00:30	0:12:11
	40	1.26		0:02:16	0:00:50		
Farley Avenue			2.50			0:00:15	0:15:31
	35	0.52		0:01:12	0:00:12		
Shorewood Boulevard			3.02			0:00:15	0:17:11
	35	0.37		0:00:57	0:00:06		
Midvale Boulevard			3.39			0:00:15	0:18:29
	30	0.46		0:01:11	0:00:56		
Sheboygan Avenue			3.85			0:00:15	0:20:50
	30	0.36		0:00:58	0:00:00		
Eau Claire Avenue			4.21			0:00:15	0:22:03
	30	0.56		0:01:23	0:00:38		
Regent Street			4.77			0:00:15	0:24:19
	30	0.55		0:01:21	0:00:04		
Mineral Point Road (MPR align)			5.32			0:02:00	0:27:45
	35	0.31		0:00:51	0:00:04		
Rosa Road			5.63			0:00:15	0:28:55
	40	0.69		0:01:24	0:00:04		
Yellow Stone Drive			6.32			0:00:15	0:30:38
	30	0.79		0:01:50	0:00:52		
Westfield Road			7.11			0:00:30	0:33:50
	40	0.65		0:01:21	0:00:45		
High Point			7.76			0:00:30	0:36:26
Totals			7.76	0:20:27	0:08:29	0:07:30	0:36:26
						Avg. Speed (mph):	12.78

Table 9
West Corridor Travel Time Estimate – Odana Road Alignment

Station	Max Spd. [mph]	Distance [mi]	Total Distance	Run Time (hr:min:sec)	Delay Time (hr:min:sec)	Dwell Time (hr:min:sec)	Total Time (hr:min:sec)
Capitol Square			0.00			0:00:00	0:00:00
	10	0.17		0:01:06	0:00:40		
State Street			0.17			0:00:30	0:02:16
	10	0.33		0:02:04	0:01:06		
Bassett Street			0.50			0:00:30	0:05:56
	20	0.36		0:01:15	0:00:50		
Park Street			0.86			0:00:30	0:08:30
	30	0.22		0:00:42	0:00:50		
Mills/Charter Street			1.08			0:00:30	0:10:32
	25	0.16		0:00:36	0:00:33		
Randall Avenue			1.24			0:00:30	0:12:11
	40	1.26		0:02:16	0:00:50		
Farley Avenue			2.50			0:00:15	0:15:31
	35	0.52		0:01:12	0:00:12		
Shorewood Boulevard			3.02			0:00:15	0:17:11
	35	0.37		0:00:57	0:00:06		
Midvale Boulevard			3.39			0:00:15	0:18:29
	30	0.46		0:01:11	0:00:56		
Sheboygan Avenue			3.85			0:00:15	0:20:50
	30	0.36		0:00:58	0:00:00		
Eau Claire Avenue			4.21			0:00:15	0:22:03
	30	0.56		0:01:23	0:00:38		
Regent Street			4.77			0:00:15	0:24:19
	30	0.55		0:01:21	0:00:04		
Mineral Point Rod (Odana Rd align)			5.32			0:00:15	0:26:00
	35	0.60		0:01:20	0:00:09		
West Transfer Point			5.92			0:02:00	0:29:28
	35	0.71		0:01:32	0:00:09		
Research Park Boulevard			6.63			0:00:15	0:31:24
	30	0.60		0:01:27	0:00:04		
Grand Canyon Drive			7.23			0:00:15	0:33:10
	25	0.45		0:01:17	0:00:29		
West Towne Mall			7.68			0:00:30	0:35:27
	25	0.28		0:00:53	0:00:00		
Westfield Road			7.96			0:00:30	0:36:50
	40	0.65		0:01:21	0:00:45		
High Point			8.61			0:00:30	0:39:26
Totals			8.61	0:22:51	0:08:20	0:08:15	0:39:26
						Avg. Speed (mph):	13.10

Travel Time Validation

The last step consists of a comparison of estimated BRT travel times to current bus travel times, as reflected in bus schedules. Existing travel times and average speeds have been determined for key routes in each BRT corridor. The route comparisons provided below do not necessarily follow the exact alignment of proposed BRT routes, but they do provide an indication of typical bus travel times and operating speeds within each corridor.

- East Corridor – Route 6 via MATC has a p.m. peak travel time of 32 minutes and an average speed of 13.5 mph from Capitol Square to East Towne Mall, with a similar alignment. The estimated BRT travel time estimate is 25:39, with an average speed of 14.7 mph, a 9 percent improvement in average speed.

- West Corridor – There is no single existing route that currently operates between Capitol Square and High Point Road along an alignment similar to the proposed BRT alignment. Route 14 comes close, with service to Mineral Point Road and Westfield Road. Existing Metro schedules indicate Route 14 has a p.m. peak travel time of 39 minutes from Capitol Square to Gammon Road and Tree Lane. The route's outbound travel time would be slightly longer to Westfield Road and Mineral Point Road. The estimated BRT travel time estimate to Westfield Road and Mineral Point Road is 33:50. Thus, BRT p.m. peak outbound travel times reflect an improvement of approximately 13 percent.

  The alternative Odana Road West Corridor alignment serves the existing West Transfer Point. There are multiple existing route options from Capitol Square to the West Transfer Point that can be used in a comparison to BRT times. Route 2 provides the most comparable local route service with a 38 minute p.m. peak period travel time. The proposed BRT travel time estimate is 29:28, a 22 percent improvement over Route 2. Routes 56 and 57 provide a quicker p.m. peak travel time of 28 minutes to the West Transfer Point. However, Routes 56 and 57 are peak period limited stop routes and do not continue to the West Towne Mall area. A transfer to either Routes 67 or 73 would be required.

- North Corridor – There is no single route that currently operates from Capitol Square to the North Town Center. A combination of Routes 2 and 22 are required to make this trip, resulting in a total travel time of about 31 minutes (including a transfer at the North Transfer Point). The estimated one-seat ride travel time for BRT is 18:11, with a 14.2 mph average speed. As a comparison, the average operating speed for Route 2 from Capitol Square to the existing North Transfer Point is 13.1 mph.

- South Corridor – There is no single route that currently operates from Capitol Square to Caddis Bend/Fish Hatchery Road along the same alignment that is proposed for BRT. Route 47 provides somewhat comparable service, with a 38 minute p.m. peak travel time. The estimated BRT travel time is 29:19 (23% faster) with an 11.25 mph average speed. For comparison purposes, the average operating speed for Routes 4 and 5 from Capitol Square to the South Transfer Point is 9.7 mph.

Finally, it is once again important to note that BRT travel times calculated for this study are intended represent *reasonable* estimates of anticipated travel times, and do not specifically take into account possible travel time impacts related to factors such as ADA boardings/alightings, weather impacts, road construction and traffic incident impacts. BRT route cycle times will be established that provide a reasonable time for recovery of such occurrences.

Kimley-Horn
and Associates, Inc

Memorandum

■
Suite 238N
2550 University Avenue West
St. Paul, Minnesota
55114

Date: November 28, 2012

To: Joe Kern
SRF Consulting Group, Inc.

From: Lisa Rasmussen, P.E.
Kimley-Horn and Associates, Inc.

Subject: Madison Transit Corridor Study – Station Site Review Methodology

This memorandum summarizes the methodology that will be used to review station location configurations (nearside, far-side, midblock), determine platform types (curb-side, bus-bay/turnout or bus-bulb) and perform a site constraint review of the shelter sizes for the Madison Transit Corridor Study.

A review of the station locations identified on the “Station and Running-way Types” graphic will be performed to determine the feasibility of constructing a BRT station at each specific location. The review will also include a determination of the shelter size and platform infrastructure needed as well as any anticipated site impacts. This review will be based on site visits, aerial and site photographs.

The following summarizes the review that will be performed to determine each of these elements:

- Shelter Size
    - The initial shelter size, which was developed based on the anticipated ridership demand, will be reviewed to determine if there is adequate space on the site, or if a smaller shelter could be used to minimize impacts to adjacent infrastructure.
- Platform Infrastructure
    - Platform type, location, and length are largely dependent on the existing site constraints – on-street parking, sidewalk widths, boulevard widths, adjacent buildings/infrastructure, etc. A high-level review of each station location, using aerial and site photographs, will be performed to determine the appropriate type, location, and length of the platform. Site impacts, that have the potential to affect cost, will also be identified. Table 1 provides a summary of the review that will be performed.

Table 1. Platform Infrastructure Summary

Platform Type	Review will determine the type of platform feasible at a particular location: • Corridor BRT: in lane, pull-out or bus-bulb • Fixed Guideway BRT: shared center or split-side platform o Split-side platforms will be provided at intersections that have exclusive left turn lanes, shared center platforms will be provided at other station locations Attached to this memo is a “Station Type Summary” table that defines the advantages/disadvantages of each station type. This information will be utilized to define the platform type at each station location.
Platform Location	Review will determine the location of the platform, near-side, far-side or mid-block, based on site constraints and existing bus service Far-side stations will be preferred over nearside or midblock stations. Attached to this memo is a “Station Location Summary” table that provides additional information on the advantages/disadvantages of the potential platform locations. This information will be utilized to determine the platform location.
Platform Length	Preferred platform length will be 60’
Site Impacts	Potential impacts to parking, existing utilities and adjacent infrastructure (sidewalk, retaining walls, etc., etc.), that are visible on site or aerial photographs, will be identified, with potential cost impacts identified within the capital cost estimate.

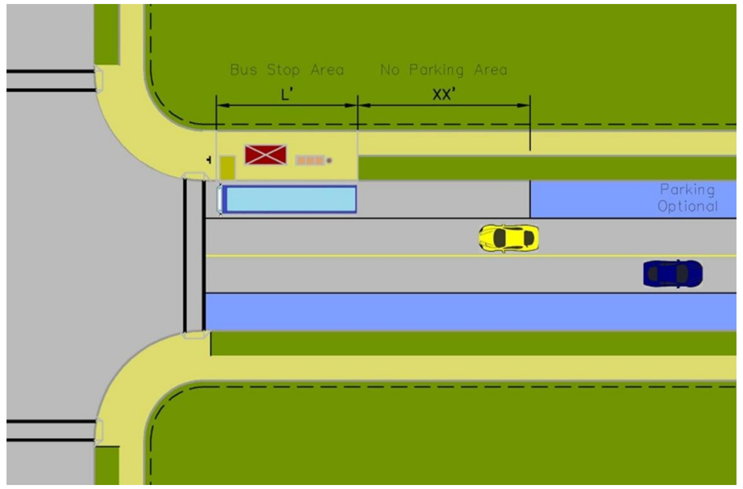
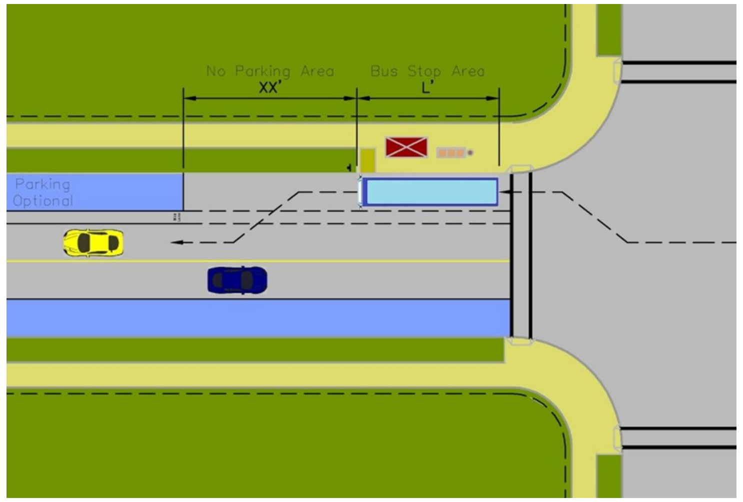
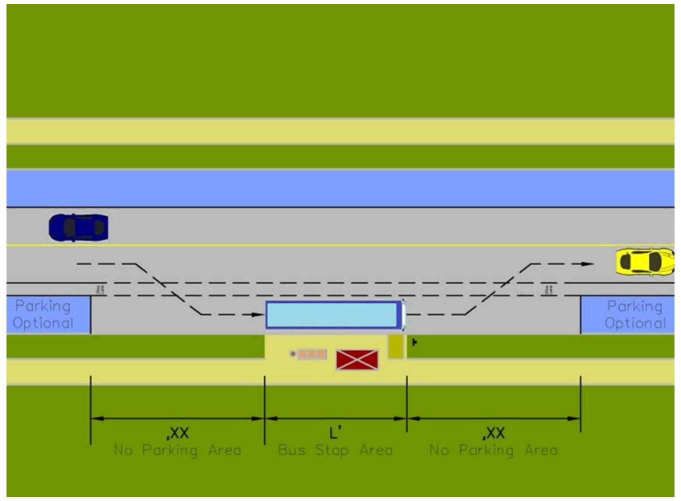
- Documentation
  - The station review to be performed will be documented in a table similar to Table 2 shown below. Shelter type, platform infrastructure, and additional site impacts for each station location (in both directions of travel) will be included in this table and will be the basis for the capital cost estimate that is developed for each corridor.

Table 2. Station Summary Example

Stop ID	On Street	Direction	Station Name	Shelter Size	Platform Type	Platform Location	Platform Length	On-Street Parking Impacts	Existing Sidewalk/ Blvd Width*	Notes
	University	WB	Farley	Small	Bus-Bulb	Far-Side	60’	0	10’	Retaining wall adjacent to platform
	University	EB	Farley	Large	Curb-Side	Near-Side	60’	0	10’	Building at the back of sidewalk

*Existing sidewalk/blvd width = face of curb to back of sidewalk

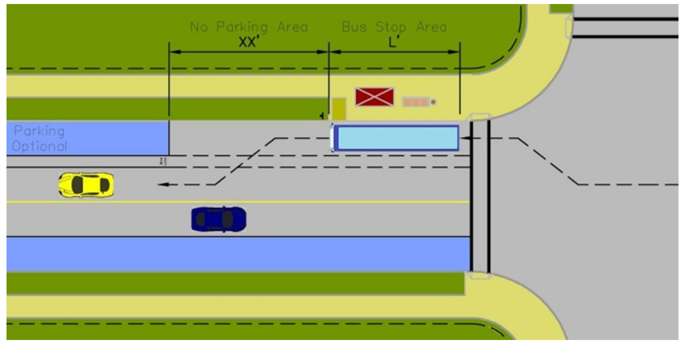
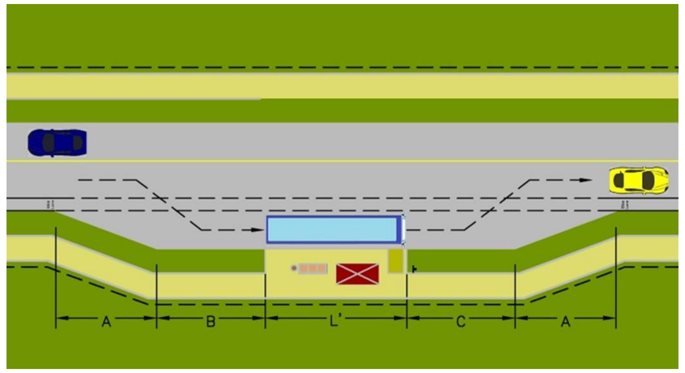
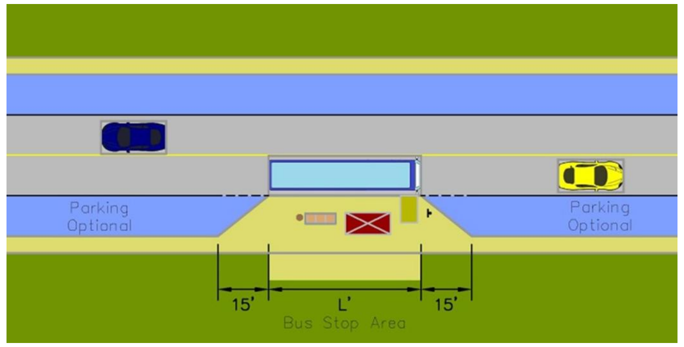
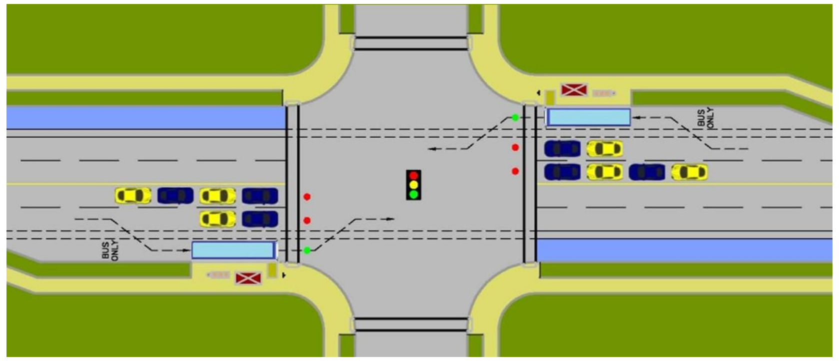
Station Location Table

LOCATION	ADVANTAGES	DISADVANTAGES	FIGURE
NEAR-SIDE	• Minimizes interference when traffic is heavy on the far side of the intersection • Allows passengers to access buses close to crosswalk • Intersection width available for bus to pull away from the curb • Eliminates the potential for double-stopping • Allows passengers to board and alight while stopped for red light • Allows drivers to look for oncoming traffic, including other buses with potential passengers	• Increases conflicts with right-turning vehicles • May result in stopped buses obscuring curbside traffic control devices and crossing pedestrians • May cause sight distance to be obscured for side street vehicles stopped to the right of the bus • Increases sight distance problems for crossing pedestrians • Complicates bus signal priority operation, may reduce effectiveness or require a special queue-jump signal if the stop is located in the parking lane or a right-turn lane	 Bus Stop Area L' No Parking Area XX' Parking Optional
FAR-SIDE	• Minimizes conflicts between right turning vehicles and buses • Provides additional right-turn capacity by making curb lane available for traffic • Minimizes sight distance problems on intersection approaches • May encourage pedestrians to cross behind the bus, depending on distance from intersection • Creates shorter deceleration distances for buses, since the intersection can be used to decelerate • Buses can take advantage of gaps in traffic flow created at signalized intersections • Facilitates bus signal priority operation, as buses can pass through intersection before stopping	• May result in intersections being blocked during peak periods by stopped buses • May obscure sight distance for crossing vehicles • May increase sight distance problems for crossing pedestrians • Can cause a bus to stop far-side after stopping for a red light, interfering with both bus operations and all other traffic • May increase the number of rear-end crashes since drivers do not expect buses to stop again after stopping at a red light • Could result in traffic queued into intersection when the bus stops in the travel lane	 No Parking Area XX' Bus Stop Area L' Parking Optional
MIDBLOCK	• Minimizes sight distance problems for vehicles and pedestrians • May result in passenger waiting areas experiencing less pedestrian congestion	• Requires additional distance for no parking restrictions • Encourages passengers to cross street mid-block (jaywalking) • Increases walking distance for passengers crossing at intersections	 Parking Optional Parking Optional XX' No Parking Area L' Bus Stop Area XX' No Parking Area

Source: TCRP Report 90v2

Madison Transit Corridor Study – Station Site Review Methodology

Station Type Table

TYPE	ADVANTAGES	DISADVANTAGES	FIGURE
IN LANE	• Provides easy access for bus drivers and results in minimal delay to bus • Is simple in design and easy and inexpensive for a transit agency to install	• Can cause traffic to queue behind stopped bus, thus causing traffic congestion • May cause drivers to make unsafe maneuvers when changing lanes in order to avoid a stopped bus	 No Parking Area XX' Bus Stop Area L' Parking Optional
PULL-OUT	• Allows patrons to board and alight out of the travel lane • Provides a protected area away from moving vehicle for both the stopped bus and the bus patrons • Minimizes delay to through traffic	• May present problems to bus drivers when attempting to re-enter traffic, especially during periods of high roadway volumes • Is expensive to install compared with curbside stop • Is difficult and expensive to relocate	
BUS-BULB	• Remove fewer parking spaces for the bus stop • Decrease the walking distance (and time) for pedestrians crossing the street • Provided additional sidewalk area for bus patrons to wait • Results in minimal delay for bus	• Cost more to install compared with curbside stop • See Curb-side disadvantages	 Parking Optional Parking Optional 15' L' 15' Bus Stop Area
QUEUE JUMP/BYPASS LANE	• Allows buses to bypass queues at a signal • See Open Bus Bay advantages	• May cause delays to right-turning vehicles when bus is at the start of the right turn lane • See Bus Bay disadvantages	

Source: TCRP Report 19-b

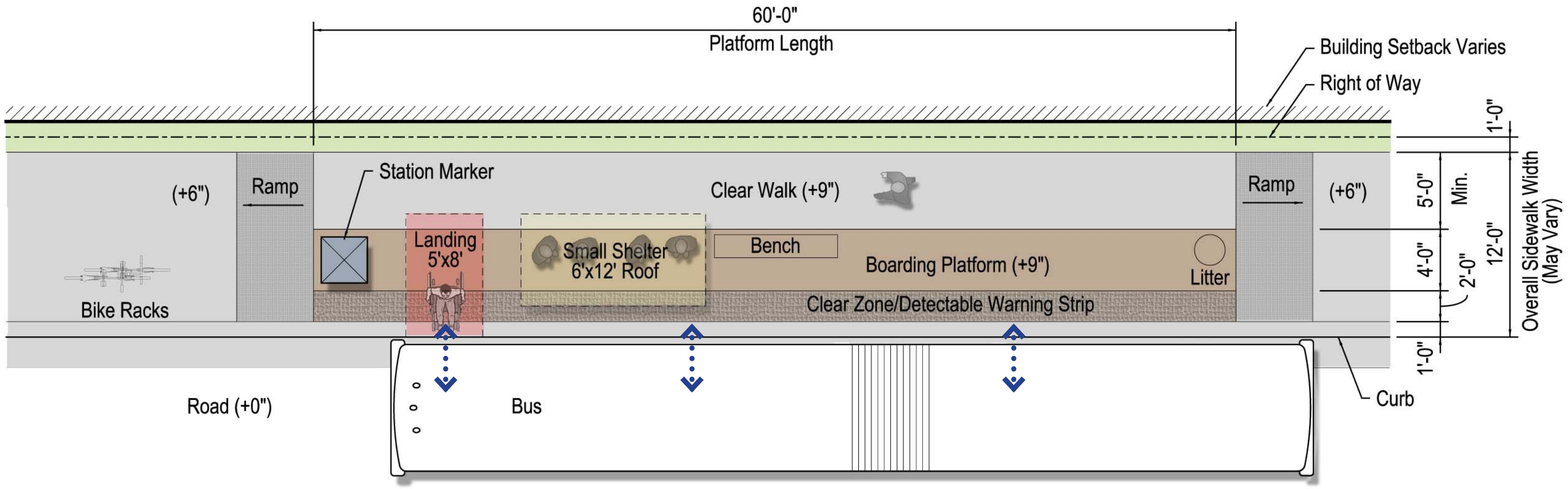
Program

(Assumes Level of Service C per APTA guidelines -
7 to 10 sq ft/person)

Small Shelter - 5 People
Waiting Area - 4x11' = 44 sq ft

Item	Small
Shelter	X
Security Camera	
Static Information Signage	X
Dynamic Information Signage	
Station Marker	X
Ticket Vending Machine	
Smart Card Reader	X
Bicycle Shelter	
Bicycle Racks	X(2)
Bicycle Lockers	
Landscaping	P
Street Trees	
Bench	P
Seat Wall/Retaining Wall	P
Leaning Rail	X
Litter Receptacles	X(1)
Newspaper Box Corral	
Lighting	X
Advertising	P
Heating	P

X = Included
P = Potential



Note: Shelter location and all furnishing locations shall be finalized based on actual field conditions and constraints.

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Station Sizing and Siting - Constrained Site - Small Shelter Plan View

Transit Corridor Study
Capitol Area Regional Planning Commission - Madision, WI

Figure 1

Draft

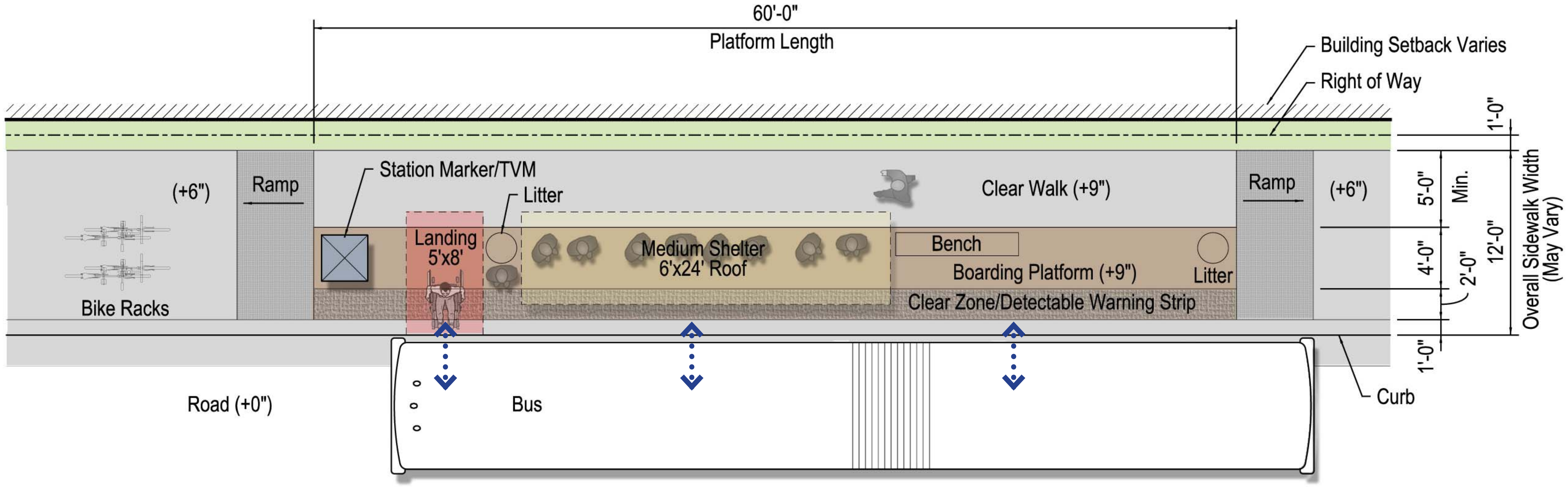
Program

(Assumes Level of Service C per APTA guidelines -
7 to 10 sq ft/person)

Medium Shelter - 10 People
Waiting Area - 4'X22' = 88 sq ft

Item	Medium
Shelter	X
Security Camera	
Static Information Signage	X
Dynamic Information Signage	X
Station Marker	X
Ticket Vending Machine	X
Smart Card Reader	X
Bicycle Shelter	
Bicycle Racks	X(4)
Bicycle Lockers	
Landscaping	P
Street Trees	
Bench	P
Seat Wall/Retaining Wall	P
Leaning Rail	X
Litter Receptacles	X(2)
Newspaper Box Corral	
Lighting	X
Advertising	P
Heating	P

X = Included
P = Potential



Note: Shelter location and all furnishing locations shall be finalized based on actual field conditions and constraints.

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Station Sizing and Siting - Constrained Site - Medium Shelter Plan View

Transit Corridor Study
Capitol Area Regional Planning Commission - Madision, WI

Figure 2

Draft

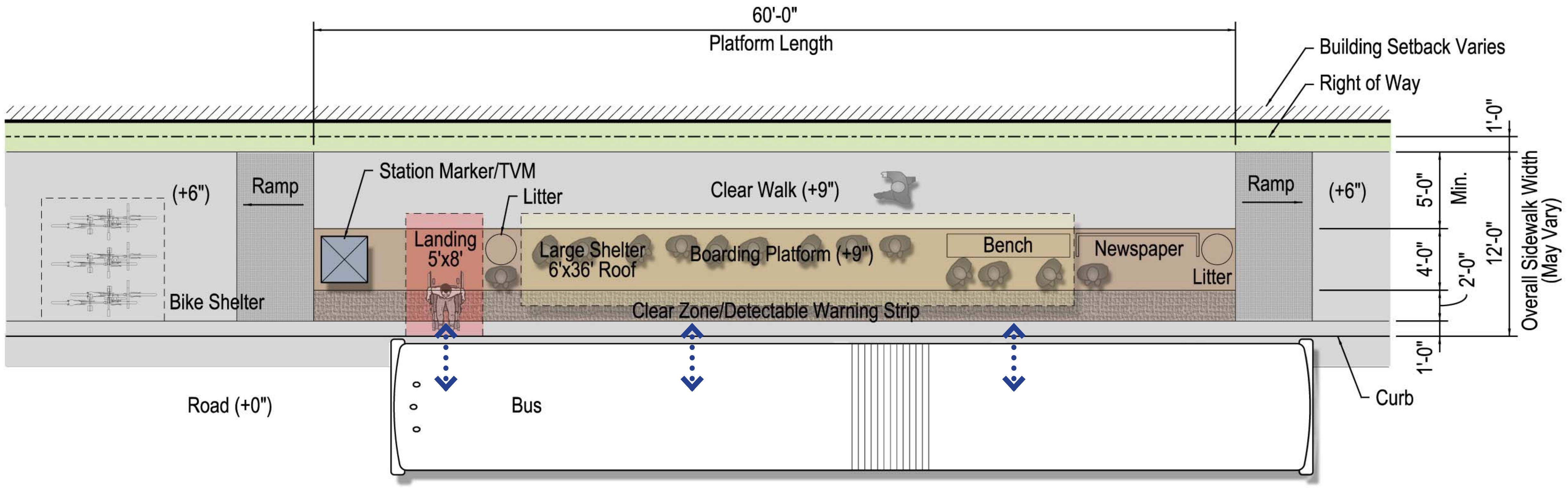
Program

(Assumes Level of Service C per APTA guidelines -
7 to 10 sq ft/person)

Large Shelter - 15 People
Waiting Area - 4'X33' = 132 sq ft

Item	Large
Shelter	X
Security Camera	X
Static Information Signage	X
Dynamic Information Signage	X
Station Marker	X
Ticket Vending Machine	X
Smart Card Reader	X
Bicycle Shelter	X
Bicycle Racks	X(6)
Bicycle Lockers	
Landscaping	P
Street Trees	
Bench	P
Seat Wall/Retaining Wall	P
Leaning Rail	X
Litter Receptacles	X(3)
Newspaper Box Corral	X
Lighting	X
Advertising	P
Heating	P

X = Included
P = Potential



Note: Shelter location and all furnishing locations shall be finalized based on actual field conditions and constraints.

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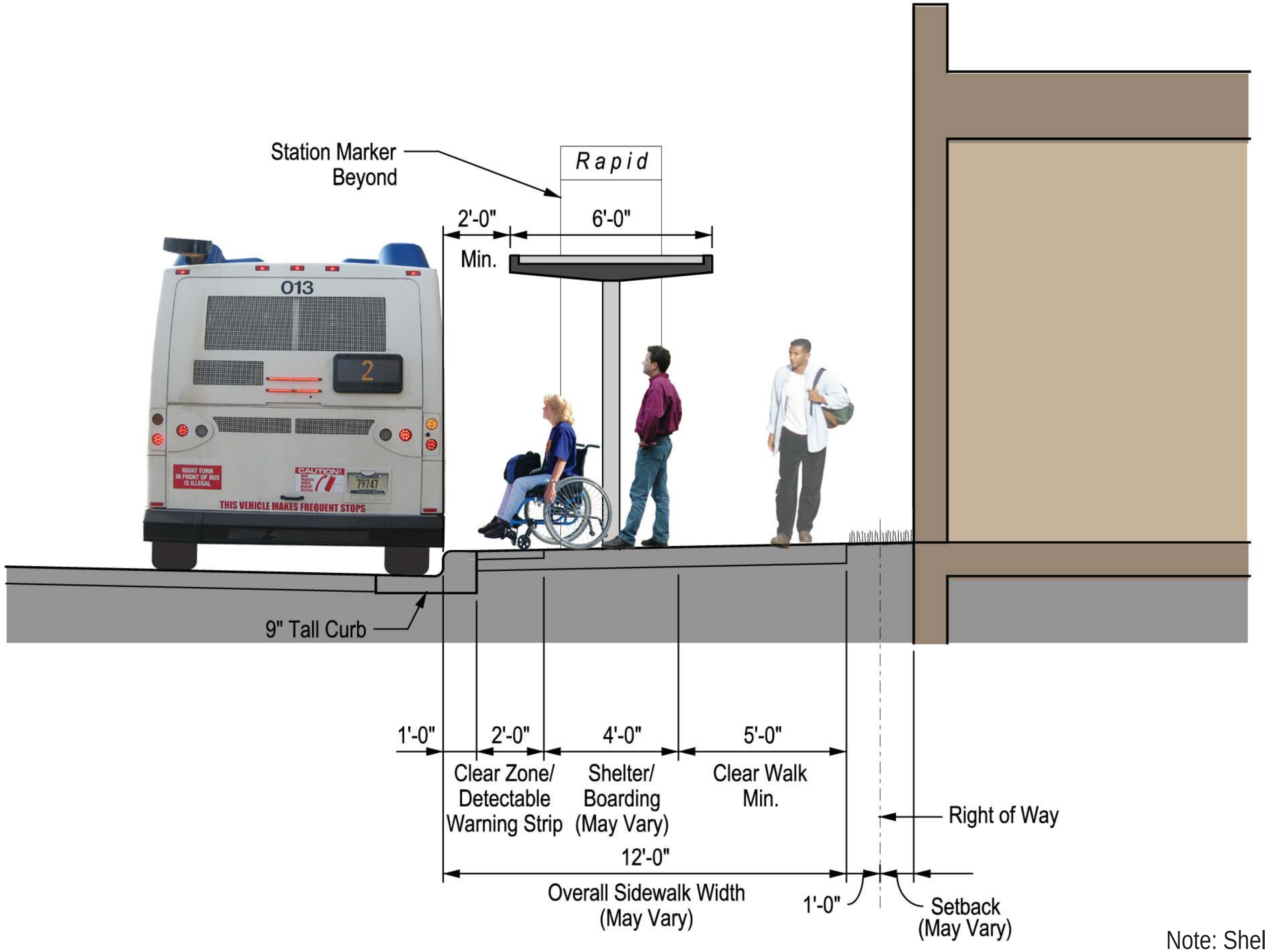
Station Sizing and Siting - Constrained Site - Large Shelter Plan View
Transit Corridor Study
Capitol Area Regional Planning Commission - Madison, WI

Figure 3
Draft



Note: Shelter location and all furnishing locations shall be finalized based on actual field conditions and constraints.

Station Sizing and Siting - Constrained Site - Section View

Transit Corridor Study

Capitol Area Regional Planning Commission - Madision, WI

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Figure 4

Draft

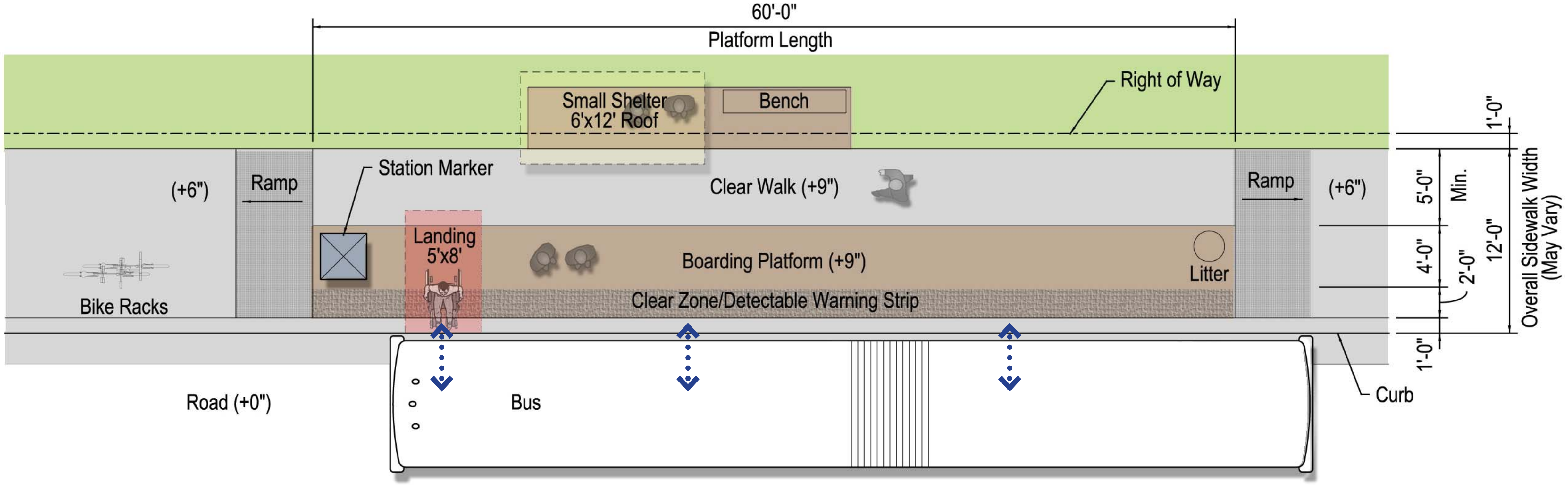
Program

(Assumes Level of Service C per APTA guidelines -
7 to 10 sq ft/person)

Small Shelter - 5 People
Waiting Area - 4'X11' = 44 sq ft

Item	Small
Shelter	X
Security Camera	
Static Information Signage	X
Dynamic Information Signage	
Station Marker	X
Ticket Vending Machine	
Smart Card Reader	X
Bicycle Shelter	
Bicycle Racks	X(2)
Bicycle Lockers	
Landscaping	P
Street Trees	
Bench	P
Seat Wall/Retaining Wall	P
Leaning Rail	X
Litter Receptacles	X(1)
Newspaper Box Corral	
Lighting	X
Advertising	P
Heating	P

X = Included
P = Potential



Note: Shelter location and all furnishing locations shall be finalized based on actual field conditions and constraints.

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Station Sizing and Siting - Unconstrained Site - Small Shelter Plan View
Transit Corridor Study
Capitol Area Regional Planning Commission - Madison, WI

Figure 5
Draft

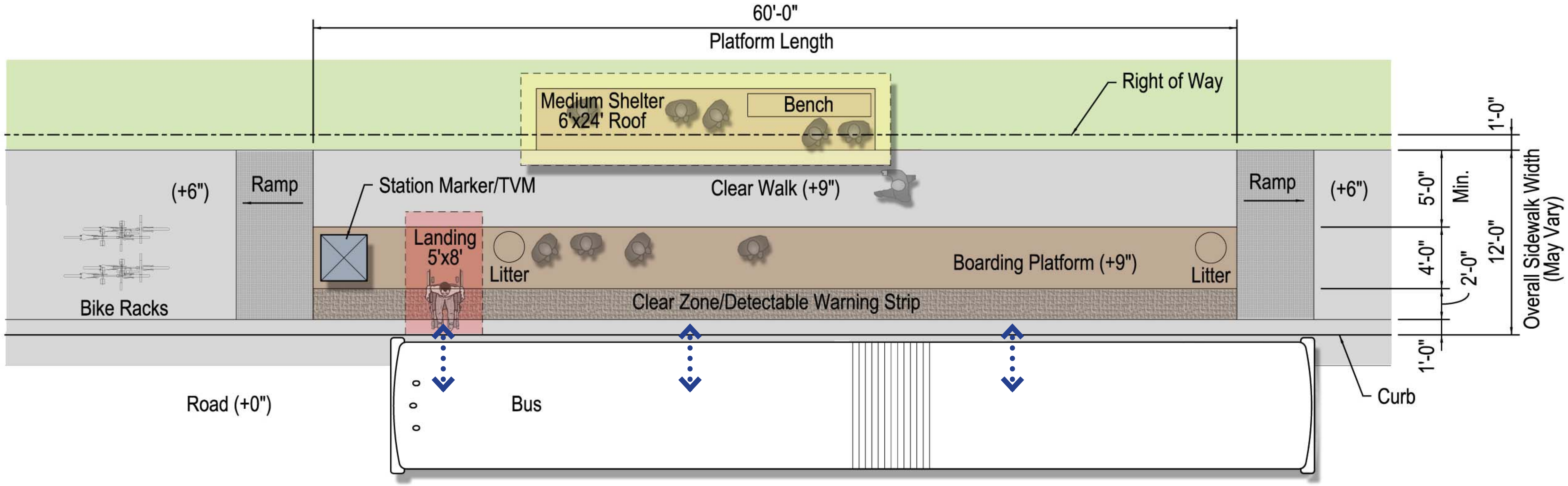
Program

(Assumes Level of Service C per APTA guidelines - 7 to 10 sq ft/person)

Medium Shelter - 10 People
Waiting Area - 4'X22' = 88 sq ft

Item	Medium
Shelter	X
Security Camera	
Static Information Signage	X
Dynamic Information Signage	X
Station Marker	X
Ticket Vending Machine	X
Smart Card Reader	X
Bicycle Shelter	
Bicycle Racks	X(4)
Bicycle Lockers	
Landscaping	P
Street Trees	
Bench	P
Seat Wall/Retaining Wall	P
Leaning Rail	X
Litter Receptacles	X(2)
Newspaper Box Corral	
Lighting	X
Advertising	P
Heating	P

X = Included
P = Potential



Note: Shelter location and all furnishing locations shall be finalized based on actual field conditions and constraints.

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Station Sizing and Siting - Unconstrained Site - Medium Shelter Plan View

Transit Corridor Study
Capitol Area Regional Planning Commission - Madision, WI

Figure 6

Draft

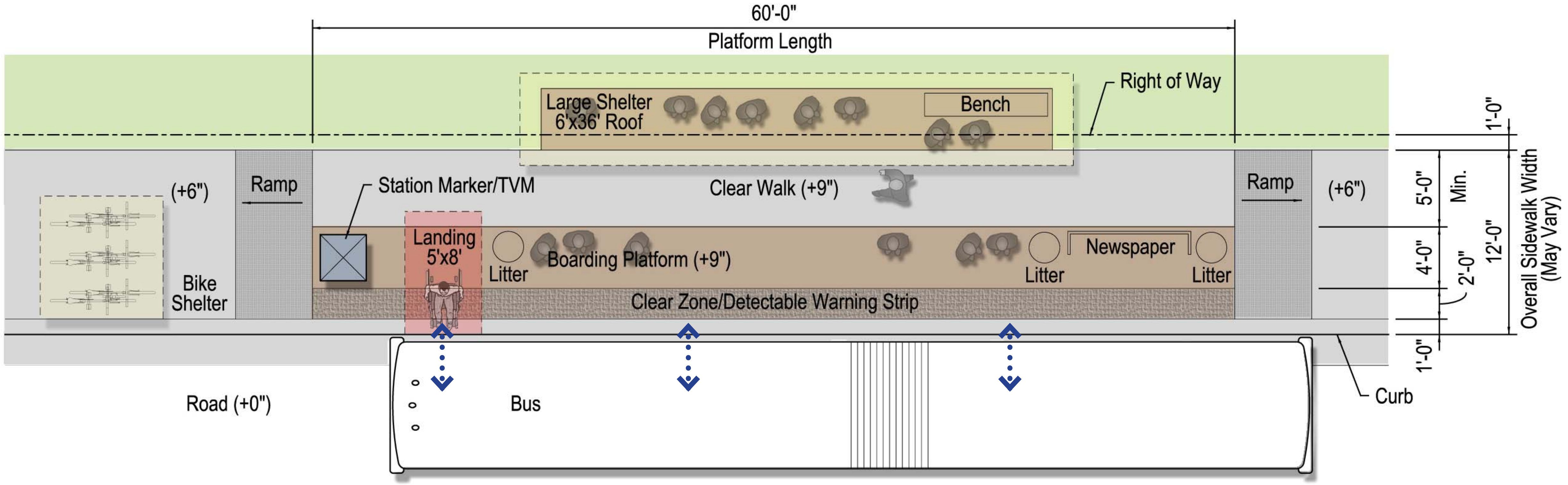
Program

(Assumes Level of Service C per APTA guidelines -
7 to 10 sq ft/person)

Large Shelter - 15 People
Waiting Area - 4'X33' = 132 sq ft

Item	Large
Shelter	X
Security Camera	X
Static Information Signage	X
Dynamic Information Signage	X
Station Marker	X
Ticket Vending Machine	X
Smart Card Reader	X
Bicycle Shelter	X
Bicycle Racks	X(6)
Bicycle Lockers	
Landscaping	P
Street Trees	
Bench	P
Seat Wall/Retaining Wall	P
Leaning Rail	X
Litter Receptacles	X(3)
Newspaper Box Corral	X
Lighting	X
Advertising	P
Heating	P

X = Included
P = Potential



Note: Shelter location and all furnishing locations shall be finalized based on actual field conditions and constraints.

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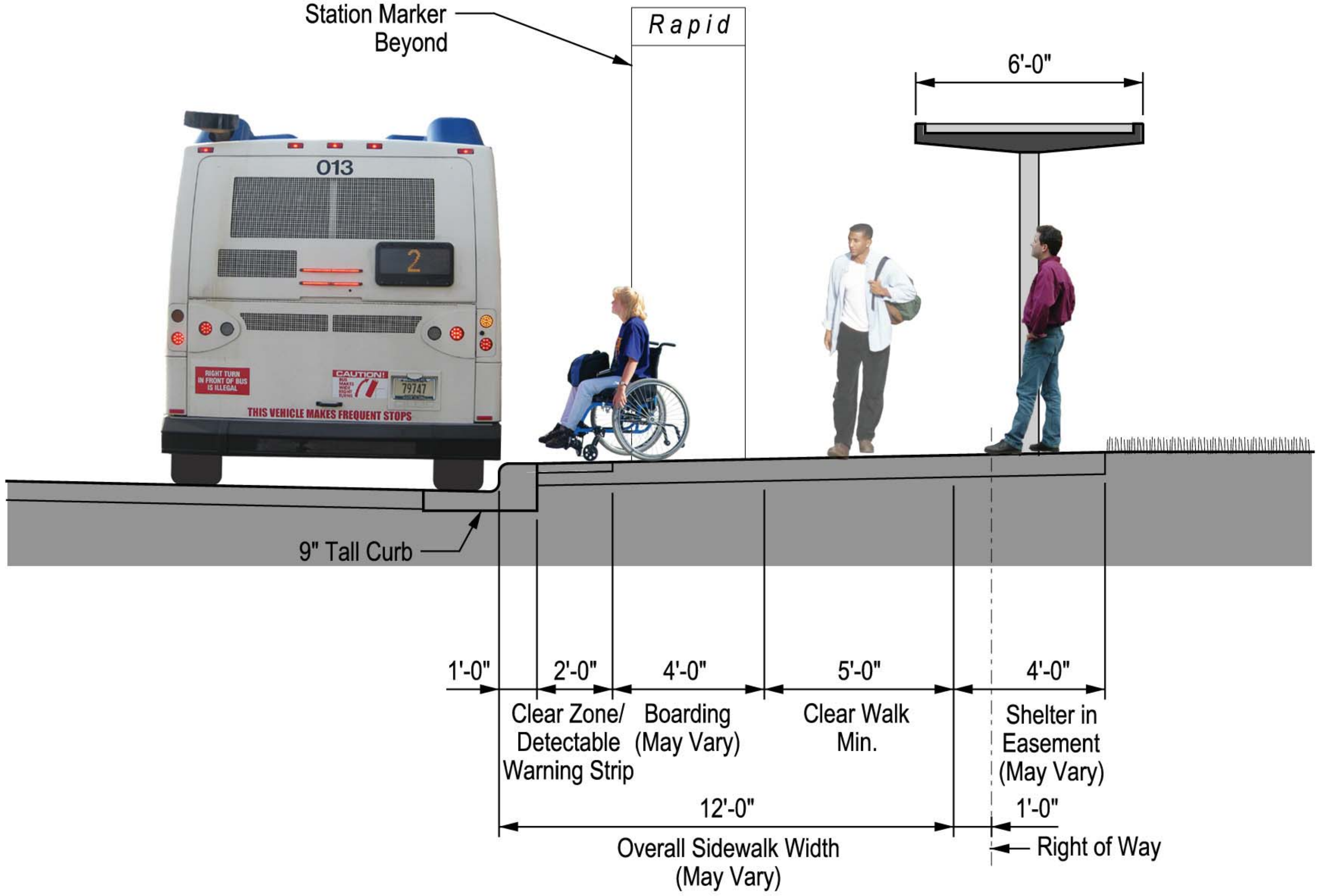
Station Sizing and Siting - Unconstrained Site - Large Shelter Plan View

Transit Corridor Study
Capitol Area Regional Planning Commission - Madision, WI

Figure 7

Draft


Station Marker Beyond
Rapid
6'-0"
013
2
THIS VEHICLE MAKES FREQUENT STOPS
9" Tall Curb
1'-0"
2'-0"
4'-0"
5'-0"
4'-0"
Clear Zone/ Detectable Warning Strip
Boarding (May Vary)
Clear Walk Min.
Shelter in Easement (May Vary)
12'-0"
Overall Sidewalk Width (May Vary)
1'-0"
Right of Way

Note: Shelter location and all furnishing locations shall be finalized based on actual field conditions and constraints.

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Station Sizing and Siting - Unconstrained Site - Section View

Transit Corridor Study

Capitol Area Regional Planning Commission - Madison, WI

Figure 8

Draft

		Item	Small	Medium	Large	Notes
1	🟥	Shelter	X	X	X	Primary identity element. Open layout with as few impediments to pedestrian circulation as possible. Modularity desirable. Clear visibility critical.
2	🟥	Security Camera			X	Consistent with system plans.
3	🟪	Static Information Signage	X	X	X	Arterial BRT branding and other passenger information (route identification, system maps, route schedules, etc.)
4	🟪	Dynamic Information Signage		X	X	Consistent with system plans.
5	🟦	Station Marker	X	X	X	Primary dentity element in conjunction with shelter. Guide for drivers for stopping location.
6	🟦	Ticket Vending Machine		X	X	Consistent with system plans.
7	🟦	Smart Card Reader	X	X	X	Consistent with system plans.
8	🟦	Bicycle Shelter			X	Overhead shelter to provide weather protection of bike rack area.
9	🟦	Bicycle Racks	X(2)	X(4)	X(6)	Increasing quantities as station size increases.
10	🟦	Bicycle Lockers				Too space consumptive for most on-line station sites but could be considered.
11	🟩	Landscaping	P	P	P	Potential where space permits on a site-specific basis. Low maintenance perennials or shrubs.
12	🟩	Street Trees				Desirable but more appropriately part of a larger streetscape plan.
13	🟧	Bench	P	P	P	More space-efficient seating elements should be considered instead to reduce circulation impediments. Potential where space permits.
14	🟧	Seat Wall/Retaining Wall	P	P	P	Only as required by surrounding grade.
15	🟧	Leaning Rail	X	X	X	Integral with shelter. Less space consumptive than traditional benches.
16	🟫	Litter Receptacles	X(1)	X(2)	X(3)	Increasing quantities as station size increases.
17	🟫	Newspaper Box Corral			X	Desirable where higher passenger volumes may attract more periodicals but kept out of the way as much as possible.
18	🟨	Lighting	X	X	X	Lighting integral with station marker and shelter. Street lightpoles more appropriately part of a larger streetscape plan.
19	🟨	Advertising	P	P	P	Integral with shelter in modular panels on a site-specific basis. Some transparency is desired so visibility is not completely cut off in certain directions.
20	🟨	Heating	P	P	P	Push-button radiant heat is desirable for passenger comfort in cold weather climate. Need to account for electrical load requirements.

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Station Sizing and Siting - Features Summary

Transit Corridor Study

Capitol Area Regional Planning Commission - Madison, WI

Figure 9

Draft

Station Sizing

Preliminary recommended station sizes are based on current ridership data, significant operational changes, such as changing a stop into a transfer point, and in some cases near term development potential or operational changes. This list will be used as an input in the station-by-station site review and in the project's capital costs estimate.

Corridor	Study Station ID	Station Name	Current Stop ID	Current Daily Boardings (inbound)	Station Size (inbound)	Current Stop ID	Current Daily Boardings (outbound)	Station Size (outbound)
EAST	E100	First Street	1350	40	Medium[1]	1241	30	Small
	E200	Fourth Street	1488	62	Medium	1141	99	Small
	E300	Milwaukee Street	1112	82	Large[1]	1311	43	Large[1]
	E400	Starkweather Creek	1938	44	Small	1481	36	Small
	E500	Melvin Court	9552	28	Small	9339	7	Small
	E600	Wright Street	9322	36	Small	9897	0	Small
	E700	Madison College	9438	22	Large	9675	21	Large
	E800	Mendota Street	9554	60	Small	9573	10	Small
	E900	Thierer Road	9152	41	Small	9587	1	Small
	E1000	East Towne Mall				9801	430	Large
WEST	W100	Park Street (@ University)	0100				1066	Large
	W200	Mills/Charter Street	0741	752	Large	0178	846	Large
	W300	Randall Avenue	0809	323	Large	0160	312	Large
	W400	Farley Avenue	2465	56	Large[1]	2698	230	Large
	W500	Shorewood Boulevard	2595	96	Medium	2714	13	Small
	W600	Midvale Boulevard	2191	271	Large	2200	28	Medium
	W700	Sheboygan Avenue	2395	140	Large	2184	34	Small
	W800	Eau Claire Avenue	2175	628	Large	2376	17	Small
	W900	Regent Street	2509	1	Small	2798	2	Small
	W1000	Mineral Point Road[2]	2401	15	Large (New WTP)	2160	6	Large (New WTP)
	W1100	Rosa Road	2793	4	Small	6820	8	Small
	W1200	Yellow Stone Drive	6129	12	Small	6516	12	Small
	W1300	Westfield Road	6755	0	Small	6426	10	Small
	W1400	High Point	6581	2	Small	6166	1	Small
WEST Odana	W1000	Mineral Point Road[2]	2401	15	Small	2160	6	Small
	W1500	West Transfer Point	6100	2634	Large	6100	2634	Large
	W1600	Research Park Boulevard	6169	2	Small	6188	1	Small
	W1700	Grand Canyon Drive	6223	8	Small	6382	3	Small
	W1800	West Towne Mall			Large	6350	162	Large
NORTH	N100	Sherman Terrace	1116	37	Medium	1177	8	Medium
	N200	Commercial Avenue	1154	23	Small	1923	3	Small
	N300	Aberg Avenue	1922	52	Large (New NTP)	1299	16	Large (New NTP)
	N400	Vahlen Street	5354	7	Small	5407	9	Small
	N500	Trailsway	5382	43	Small	5683	19	Small
	N600	Warner Park	5162	34	Large[1]	5741	0	Large[1]

[1] Ridership/station size contradiction due to expected near term future development and/or service plan changes that will cause ridership to increase at these locations

[2] The size of the Mineral Point Station varies with the West Alignment Alternatives. On the Mineral Point Road Alternative this station becomes the new West Transfer Point

[3] The existing shelters at these stations will be retained.

Corridor	Study Station ID	Station Name	Current Stop ID	Current Daily Boardings (inbound)	Station Size (inbound)	Current Stop ID	Current Daily Boardings (outbound)	Station Size (outbound)
SOUTH	S100	Park Street (between Uni. & Johnson)				0538	214	Large
	S200	Regent Street	0115	184	Large	0546	23	Small
	S300	W. Washington Avenue	0217	5	Small	0840	27	Small
	S400	Erin Street	0251	27	Small	0288	27	Small
	S500	Olin Avenue	0107	27	Small	0360	10	Small
	S600	Wingra Creek	0745	26	Small	0124	1	Small
	S700	Bram Street			Small			Small
	S800	Villager Mall	0475	45	Small	0906	18	Small
	S900	South Transfer Point				4100	2159	Large
	S1000	Badger Road	0353	30	Small	0782	40	Small
	S1100	Greenway Cross	4449	22	Small	4622	0	Small
	S1200	Post Road	4523	43	Small	4752	22	Small
	S1300	Caddis Bend	4941	28	Small	4699	19	Small
Central	C100	Park Street (@ Johnson St.)	0455	613	Large			
	C200	Bassett Street	0555	31	Medium	0428	330	Large
	C300	State Street	0883	284	*Not needed* [3]	1588	203	*Not needed* [3]
	C400	Capitol Square North	1100	689	*Not needed* [3]			
	C500	Capitol Square South	1101	778	*Not needed* [3]			
	C600	Webster Street	1323	57	Medium	1618	83	Medium
	C700	Blair Street	1214	22	Small	1579	34	Small
	C800	Paterson Street	1660	24	Medium	1565	21	Medium
	C900	Baldwin Street	1730	41	Small	1883	22	Small

[1] Ridership/station size contradiction due to expected near term future development and/or service plan changes that will cause ridership to increase at these locations

[2] The size of the Mineral Point Station varies with the West Alignment Alternatives. On the Mineral Point Road Alternative this station becomes the new West Transfer Point

[3] The existing shelters at these stations will be retained.

EAST

Study Station ID	Stop ID	On Street	Direction	Station Name	Final Shelter Size	Platform Type	Initial Platform Location	Final Platform Location	Platform Length	On-Street Parking Impacts	Existing Sidewalk/Blvd Width*	Constrained/Unconstrained Site	Notes
E100	1350	East Washington	IB	First Street	Medium	Curbside	Farside	Farside	60	No	10	Unconstrained	Proposed station will need to be located 60 West of the begin of the tangent onto Washington due to a existing driveway that has no other outlet. The proposed station will cover another existing driveway to a parking lot that has multiple entrances. Also there are 3 signs and 1 bus stop landing in the proposed station footprint. The existing sidewalk is only 10 wide and ROW from the parking lot will need to be purchased to allow it to be a unconstrained station. This will cause a loss of one row of parking in the very large lot.
E200	1488	East Washington	IB	Fourth Street	Medium	Curbside	Nearside	Nearside	60	No	12	Unconstrained	There is a light pole, bench, and trash receptacle within the proposed stations footprint. ROW will need to be purchased to allow for a unconstrained station. This will cause a loss of some grass/yard in front of the Madison East High School. Bike lane in outside lane where bus would stop at station.
E300	1112	East Washington	IB	Milwaukee Street	Medium	Curbside	Farside	Farside	60	No	12	Constrained	Proposed station has a tree, 2 signs, trash receptacle, and bus stop shelter. The station will consume the entire curb to face of building space and the entrances to the retail store may be affected by the station. A nearside location has more room and would allow for a unconstrained station, but the farside was analyzed due to the initial location suggestion.
E400	1938	East Washington	IB	Starkweather Creek	Small	Curbside	Nearside	Nearside	60	No	12	Unconstrained	The proposed station location need to be offset to the East of Starkweather Creek by >20 to allow for construction of the station and width of the station. There is a tree and a fire hydrant in the footprint of the station. Grassy area behind the sidewalk allows this station to be unconstrained.
E500	9552	East Washington	IB	Melvin Court	Small	Curbside	Farside	Farside	60	No	12	Unconstrained	There are 2 trees and a light pole located in the Proposed station footprint. Some ROW may be needed to allow for a unconstrained station.
E600	9322	East Washington	IB	Wright Street	Small	Curbside	Nearside	Nearside	60	No	10	Unconstrained	The proposed station location only has 10 of sidewalk/Blvd but there is a grassy area behind it that will allow the station to be unconstrained. There is a tree, light pole, and a handhole in the footprint of the station. Existing sidewalk heading NW also intersects where the station is proposed and will need to be modified to the station. Also there is a bike lane in the outside lane where the bus will stop to service the station.
E700	9438	East Washington	IB	Madison College	Large	Curbside	N/A	Farside	60	No	12	Unconstrained	Proposed station location includes 2 trees, a light pole, and fire hydrant within the footprint. This station is proposed to be located on the farside of the South entrance of the Madison College Mitby Theater, midway between Wright St and Stoughton Rd along Anderson St. (No conditional diagram, information found using Google Earth.)
E800	9554	East Washington	IB	Mendota Street	Small	Curbside	Farside	Farside	60	No	12	Constrained	The proposed station has a sign, tree, bus stop shelter, and a trash receptacle within the footprint. The station will take up the entire curb to face of building entrance which has a raised entrance and will not be affected by the raised platform. There is a bike lane in the outside lane where the bus will stop to service the station.
E900	9152	East Washington	IB	Thierer Road	Small	Curbside	Farside	Farside	60	No	14	Unconstrained	The proposed station only has 1 tree located in the footprint of the station. The location allows for the station to be unconstrained, but there maybe need to buy a 1-2 strip of ROW from the adjacent parking lot. There is a bike lane in the outside lane where the bus will stop to service the station.
E1000		East Washington	IB	East Towne Mall									Station located in the East Towne Mall as a turn around point. Existing East Towne RNG & Shelter (EB). (No conditional diagram, information found using Google Earth.)
E100	1241	East Washington	OB	First Street	Small	Curbside	Nearside	Nearside	60	No	14	Constrained	Proposed station will need to be placed between 2 residential driveways (60) and the ramps to the station (5 on either side) may need to cut into part of the existing driveways on both sides of the station. In the footprint of the station there is 2 trees and 1 electrical pole. Farside location in not possible because of more frequent residential driveways.
E200	1141	East Washington	OB	Fourth Street	Small	Curbside	Nearside	Nearside	60	Yes	12	Constrained	The proposed station will be located within 10 from the intersection cross walk due to a residential driveway on the West end of the station. These things are located in the footprint of the proposed station: electrical pole, sign, tree, fire hydrant, trash receptacle, and bench.
E300	1311	East Washington	OB	Milwaukee Street	Large	Curbside	Nearside	Nearside	60	No	14	Unconstrained	The proposed station footprint includes a tree and a sign. Currently there is nothing in the lot behind the location of the proposed station, so ROW maybe be purchased to allow for a unconstrained station with no impacts to the lot. A right turn lane is in the outside lane where the bus will stop for the station.
E400	1481	East Washington	OB	Starkweather Creek	Small	Curbside	Nearside	Nearside	60	No	12	Unconstrained	The proposed station includes 3 electrical boxes, a light pole, fire hydrant, and a tree. There is also a right turn lane in the outside lane that the bus will stop in to service the station. ROW will need to be purchased to allow this station to be a unconstrained station, and the impact of this will be minimizing the size of the gas station parking lot.
E500	9339	East Washington	OB	Melvin Court	Small	Curbside	Farside	Farside	60	No	12	Unconstrained	There are 3 trees, a fire hydrant, and a electrical pole in the footprint of the proposed station. This station will need to purchase ROW to allow for a unconstrained station, which will result in removing a row of shrubs and possibly taking part of the parking lot adjacent to the station.
E600	9897	East Washington	OB	Wright Street	Small	Curbside	Farside	Farside	60	No	10	Unconstrained	Only 10 of sidewalk/Blvd but grassy area in front of the building allows for a unconstrained station. There is a handhole, fire hydrant, Light pole, bench, and sign all in the footprint of the proposed station.
E700	9675	East Washington	OB	Madison College	Large	Curbside	N/A	Farside	60	No	12	Unconstrained	Proposed station is located at the existing Anderson & Madison College (EB) bus stop outside of Lake College Madison Center. In the footprint of the station there is 1 tree and 1 sign. (No conditional diagram, information found using Google Earth.)
E800	9573	East Washington	OB	Mendota Street	Small	Curbside	Farside	Farside	60	No	10	Unconstrained	The proposed station has a light pole, bus stop landing, sign, and tree located in the footprint of the station. ROW will need to be purchased to allow for a width of 12 and allow for the option of a unconstrained station. A row of shrubs and possible part of the parking lot will need to be taken to allow this station to fit. There is a bike lane in the outside lane where the bus will stop to service the station.
E900	9587	East Washington	OB	Thierer Road	Small	Curbside	Nearside	Farside	60	No	16	Unconstrained	There is a tree and a handhole in the footprint of the proposed station. Also there is plenty of green space to allow the station to be a unconstrained station. The station s proposed location was selected to connect the ramp of the station with the existing bus stop landing.
E1000	9801	East Washington	OB	East Towne Mall	Large	Curbside	N/A	N/A	60	No	-	Constrained	Station located in the East Towne Mall as a turn around point. Existing East Towne RNG & Shelter (EB). (No conditional diagram, information found using Google Earth.)

WEST

Study Station ID	Stop ID	On Street	Direction	Station Name	Final Shelter Size	Platform Type	Initial Platform Location	Final Platform Location	Platform Length	On-Street Parking Impacts	Existing Sidewalk/Blvd Width*	Constrained/Unconstrained Site	Notes
W200	741	University / Johnson	IB	Mills/Charter Street	Large	Curbside	Nearside	Nearside	60	No	10	Constrained	Partially Constrained - Building adjacent to ROW at existing bus shelter. ROW would need to be taken at parking lot to fit 12' platform. One sign would need to be relocated.
W300	809	Campus Drive	IB	Randall Avenue	Large	Curbside		Nearside	60	No	13	Unconstrained	One sign and one tree would need to be removed. One storm sewer inlet would be in conflict.
W400	2465	University Ave	IB	Farley Avenue	Large	Curbside	Nearside	Nearside	60	No	14	Unconstrained	Parking lot adjacent to ROW. One sign would need to be relocated. Overhead electric lines and possibly underground electric present. Manhole present outside of limits of platform but utility could extend into platform area.
W500	2595	University Ave	IB	Shorewood Boulevard	Medium	Curbside	Farside	Farside	60	No	10	Constrained	Building behind ROW. ROW will be needed at this location. There is a landscaping retaining wall at the ROW. There is one manhole and one storm sewer inlet that are likely in conflict.
W600	2191	University Ave	IB	Midvale Boulevard	Large	Curbside	Farside	Farside	60	No	8	Constrained	Partially Constrained - There is a retaining wall through a portion of the platform behind the ROW. ROW will need to be purchased for a 12' platform. Electric for street lights is likely in conflict. One storm sewer inlet is just west of the platform - There could be storm sewer impacts depending on which direction the pipe enters/leaves the inlet.
W700	2395	Sheboygan Ave	IB	Sheboygan Avenue	Large	Curbside	Nearside	Nearside	60	No	18	Constrained	Partially Constrained - There is a retaining wall through a portion of the platform behind the ROW. Fire hydrant conflict could be avoided with platform placement. Water line feeding fire hydrant could be in conflict. One sign and existing bus stop furniture will need to be relocated.
W800	2175	Sheboygan Ave	IB	Eau Claire Avenue	Large	Curbside	Farside	Farside	60	No	5-6	Unconstrained	Existing station furniture will need to be relocated.
W900	2509	Whitney Way	IB	Regent Street	Small	Curbside	Farside	Farside	60	No	14	Unconstrained	Residential. 2 signs will need to be relocated.
W1000	2401	Whitney Way	IB	Mineral Point Road2	TP - Large	TP	N/A	N/A	TP	No	12	Unconstrained	There is one tree and one sign to be removed. Potential Electric feed for street lights. Larger shelter will fit.
W1100	2793	Mineral Point Road	IB	Rosa Road	Small	Curbside	Farside	Farside	60	No	12	Unconstrained	There is one tree and one sign to be removed.
W1200	6129	Mineral Point Road	IB	Yellow Stone Drive	Small	Curbside	Farside	Farside	60	No	12	Unconstrained	Unconstrained but with some utilities present behind ROW. One sign will need to be relocated. ROW may be needed to fit 12' platform. There are manholes just west of the platform - there may be utility conflicts at this location.
W1300	6755	Mineral Point Road	IB	Westfield Road	Small	Curbside	Farside	Farside	60	No	25	Unconstrained	One tree and one sign to be relocated. Fire hydrant is located behind platform area but water feed could be a potential conflict. Potential conflict with electric feed to street lights
W1400	6581	Mineral Point Road	IB	High Point	Small	Curbside		Farside	60	No	12	Constrained	Potentially Constrained - There is space above ground but there may be underground storage tanks for the gas station at this location. There is a storm sewer inlet in conflict. The conflict may be removed by shifting platform to the east. There may be ROW needed depending on the location of the ROW.
W100		University / Johnson	OB	Park Street (@ University)	Large	Curbside	Farside	Farside	60	No	21	Unconstrained	If placed at intersection, one tree would need to be removed and potential storm sewer inlet conflict. The station could be moved west of the driveway where what appears to be an existing bus stop is located. There would be two storm sewer inlets with potential conflicts at this location.
W200	178	University / Johnson	OB	Mills/Charter Street	Large	Curbside	Farside	Farside	60	No	15	Constrained	Retaining wall at ROW or just behind ROW. Metal barrier would need to be removed.
W300	160	University Drive	OB	Randall Avenue	Large	Curbside		Farside	60	No	16	Unconstrained	One sign would need to be relocated. This would replace/supplement the existing bus stop. One potential storm sewer inlet conflict that could possibly be avoided by careful placement of platform.
W400	2698	University Ave	OB	Farley Avenue	Large	Curbside	Farside	Farside	60	No	5	Unconstrained	One storm sewer inlet may be in conflict. Fire hydrant and street lights nearby - Potential water and electrical conflicts. Could have a ROW impact depending on where the ROW line is located.
W500	2714	University Ave	OB	Shorewood Boulevard	Small	Curbside	Nearside	Nearside	60	No	7	Unconstrained	Parking Lot behind will be impacted. ROW is needed for the platform at this location. Street light electric in this area.
W600	2200	University Ave	OB	Midvale Boulevard	Medium	Curbside	Farside	Nearside	60	No	9	Unconstrained	ROW will be needed to allow a 12' platform. There is a small curb/retaining wall through part of the ROW needed. Street light electric may be in conflict. There is a manhole/handhole behind the existing sidewalk that could be in conflict with the platform. One storm sewer inlet is just east of the platform - There could be storm sewer impacts depending on which direction the pipe enters/leaves the inlet.
W700	2184	Sheboygan Ave	OB	Sheboygan Avenue	Small	Curbside	Farside	Farside	60	No	19	Unconstrained	One sign would need to be relocated.
W800	2376	Sheboygan Ave	OB	Eau Claire Avenue	Small	Curbside	Farside	Farside	60	No	5	Unconstrained	Two trees will be in conflict. Street lights and electric feeds may be in conflict. One fire hydrant nearby not in conflict but water feed may be.
W900	2798	Whitney Way	OB	Regent Street	Small	Curbside	Farside	Farside	60	No	14	Unconstrained	Residential area. 2 signs and 1 tree will need to be relocated. Depending on platform placement, 1 storm sewer inlet may be in conflict.
W1000	2160	Whitney Way	OB	Mineral Point Road2									There is one tree and one sign to be removed. Potential Electric feed for street lights. Larger shelter will fit. ROW may be needed.
W1100	6820	Mineral Point Road	OB	Rosa Road	Small	Curbside	Farside	Farside	60	No	13	Unconstrained	Fire hydrant and water line in conflict with platform. Could potentially shift platform to west to avoid fire hydrant but other conflicts are created. There is one manhole in conflict. ROW line not shown - ROW may be necessary for 12' platform.
W1200	6516	Mineral Point Road	OB	Yellow Stone Drive	Small	Curbside	Farside	Farside	60	No	12	Constrained	Partially Constrained - Large brick structure behind ROW at portion of platform. One tree and sign will need to be removed.
W1300	6426	Mineral Point Road	OB	Westfield Road	Small	Curbside	Farside	Farside	60	No	12	Unconstrained	Property behind is a cemetery. One sign to be removed. One storm sewer inlet just east of the platform. Not a direct conflict but storm sewer pipe may be.
W1400	6166	Mineral Point Road	OB	High Point	Small	Curbside		Farside	60	No	13	Unconstrained	Unconstrained but probably undesirable due to elevation change with adjacent parking lot. One tree and 2 signs need to be removed. One telephone box and underground telephone is in conflict. The conflict with the box could be avoided by shifting the platform west but the platform would likely still be in conflict with the underground telephone cables. There may be ROW needed depending on the location of the ROW.

WEST - ODANA

Study Station ID	Stop ID	On Street	Direction	Station Name	Final Shelter Size	Platform Type	Initial Platform Location	Final Platform Location	Platform Length	On-Street Parking Impacts	Existing Sidewalk/Blvd Width*	Constrained/Unconstrained Site	Notes
W1000	2401	Whitney Way	IB	Mineral Point Road2	Small	Curbside	Farside	Farside	60	No	12	Unconstrained	There is one tree and one sign to be removed. Potential Electric feed for street lights. Larger shelter will fit.
W1500	6100	Tokay Blvd	IB	West Transfer Point	TP - Large	TP	N/A	N/A	TP	No		Unconstrained	
W1600	6169	Odana Road	IB	Research Park Boulevard	Small	Curbside	Nearside	Nearside	60	No	10	Unconstrained	ROW may be needed.
W1700	6223	Odana Road	IB	Grand Canyon Drive	Small	Curbside	Farside	Farside	60	No	15	Unconstrained	Station is on a curve if placed at intersection. Could be moved 60'-80' if tangent platform is desired. The tangent placement would have impacts to trees and possibly one sign. Larger shelter will fit.
W1800		Mall	IB	West Towne Mall	Large	Curbside	N/A	N/A	60	No		Unconstrained	
W1000	2160	Whitney Way	OB	Mineral Point Road2	Small	Curbside	Farside	Farside	60	No	12	Unconstrained	There is one tree and one sign to be removed. Potential Electric feed for street lights. Larger shelter will fit. ROW may be needed.
W1500	6100	Tokay Blvd	OB	West Transfer Point									
W1600	6188	Odana Road	OB	Research Park Boulevard	Small	Curbside	Nearside	Nearside	60	No	10	Unconstrained	Power Pole and electrical for loops and signals conflict. ROW may be needed.
W1700	6382	Odana Road	OB	Grand Canyon Drive	Small	Curbside	Farside	Farside	60	No	15	Unconstrained	Signal/Street Light and electrical boxes will need to be relocated. 2 Trees and 1 sign will be impacted. Placement on farside is impacted by adjacent driveway. Station elements could create a sight distance issue for the shopping center patrons. There is room to place station on far side of the driveway (approximately 150' from intersection). There are some minor electrical impacts if a nearside station is placed at this intersection but they do not include a signal pole relocation.
W1800	6350	Mall	OB	West Towne Mall									

NORTH

Study Station ID	Stop ID	On Street	Direction	Station Name	Final Shelter Size	Platform Type	Initial Platform Location	Final Platform Location	Platform Length	On-Street Parking Impacts	Existing Sidewalk/Blvd Width*	Constrained/Unconstrained Site	Notes
N100	1116	Sherman Avenue	IB	Sherman Terrace	Medium	Curbside	Nearside	Farside	60	No	12	Unconstrained	The proposed station location includes a portion of the driveway entrance to the apartment complex. This complex has an additional entrance, and the affect entrance will be able to be turned into a single lane entrance likely. The removal of a few trees may be needed to allow for a unconstrained station. For this station location the intersection of S. Lakewood Garden Lane/Fordem Ave was looked at. (No conditional diagram, information found using Google Earth.)
N200	1154	Sherman Avenue	IB	Commercial Avenue	Small	Curbside	Nearside	Nearside	60	No	12	Unconstrained	The location of the proposed station will be in front of a vacant lot with nothing located in the footprint of the station. ROW will need to be purchased from the vacant lot to allow the station to be a unconstrained station.
N300	1922	Sherman Avenue	IB	Aberg Avenue	TP - Large	TP	N/A	N/A	TP	No	10	Unconstrained	The proposed station location has a manhole and a sign within the footprint of the station. ROW will need to be purchased to allow for a 12 station, and allow for the station to be unconstrained. The apartment located adjacent to the station has a grassy landscape area that matches up to the sidewalk which will allow for the purchase of ROW. Some shrubs and grass will need to be taken out.
N400	5354	Sherman Avenue	IB	Vahlen Street	Small	Curbside	Farside	Farside	60	No	12	Unconstrained	Proposed station is located on the Southwest side of the Vahlen/Sherman intersection. The sidewalk/Blvd width will allow for the station to be unconstrained, but some of the existing rain garden may need to be removed. (No conditional diagram, information found using Google Earth.)
N500	5382	Sherman Avenue	IB	Trailsway	Small	Curbside	Nearside	Nearside	60	No	12	Unconstrained	Proposed station is located in the same location as the existing Sherman/Trailsway bus stop, which has a shelter. Between the sidewalk and the grassy area behind it there is enough room to allow this station to be unconstrained with the purchase of some ROW. (No conditional diagram, information found using Google Earth.)
N600	5162	Sherman Avenue		Warner Park	Large	Curbside	Farside	Farside	60	No	16	Unconstrained	Within the proposed station footprint there is a light pole. The sidewalk/Blvd area allows for a unconstrained station with no additional ROW purchased.
N100	1177	Sherman Avenue	OB	Sherman Terrace	Medium	Curbside	Nearside	Farside	60	No	6	Unconstrained	To allow for a proposed station location additional ROW will need to be purchased to allow for a 12 wide station, and with the green space behind the sidewalk this is possible. For this station location the intersection of S. Lakewood Garden Lane/Fordem Ave was looked at. (No conditional diagram, information found using Google Earth.)
N200	1923	Sherman Avenue	OB	Commercial Avenue	Small	Curbside	Nearside	Nearside	60	No	12	Constrained	Proposed station location uses the entire curb to face of building width of 12 . Building entrance in offset into the store so raised platform will not affect the door opening. A driveway entrance to the parking lot located behind the store is within the proposed station footprint, but there is another larger driveway entrance located on the other side of the store which will allow the station to occupy the area where this one currently exists. Also there is a light pole in the footprint of the station.
N300	1299	Sherman Avenue	OB	Aberg Avenue									ROW will need to be purchased to allow for a 12 station, and allow for the station to be unconstrained. A strip of the existing parking lot will be taken to allow this. Within the footprint of the station there are 2 signs, 2 electrical pole, and a handhole.
N400	5407	Sherman Avenue	OB	Vahlen Street	Small	Curbside	Farside	Farside	60	No	12	Unconstrained	Proposed station is located on the Northeast side of the Vahlen/Sherman intersection. The sidewalk/Blvd width will allow for the station to be unconstrained, but some of the existing rain garden may need to be removed. Also a driveway entrance to the parking lot for Madison Chiropractic North is located in the footprint of the station. This parking lot has 2 additional driveway entrances, one from each street, to continue to allow access to the parking lot. (No conditional diagram, information found using Google Earth.)
N500	5683	Sherman Avenue	OB	Trailsway	Small	Curbside	Farside	Farside	60	No	12	Unconstrained	Proposed station is located across the street for the existing Sherman/Trailway bus stop, in the front of some residential homes. Between the sidewalk and the grassy front yards of the homes there is enough room to allow at least a 12 wide station and for this station to be unconstrained with the purchase of some ROW. (No conditional diagram, information found using Google Earth.)
N600	5741	Sherman Avenue	OB	Warner Park	Large	Curbside	Nearside	Nearside	60	No	10	Unconstrained	Within the proposed station footprint there is a manhole. To allow this station to be at least 12 and a unconstrained station, additional ROW will need to be purchased. From this purchase a small section of grassy area located in the gas station lot will need to be removed.

SOUTH

Study Station ID	Stop ID	On Street	Direction	Station Name	Final Shelter Size	Platform Type	Initial Platform Location	Final Platform Location	Platform Length	On-Street Parking Impacts	Existing Sidewalk/Blvd Width*	Constrained/Unconstrained Site	Notes
S200	0115	Park Street	IB	Regent Street	Large	Curbside	Farside	Farside	60	No	18	Constrained	Building close to ROW. There is an existing bump-out on the sidewalk where benches sit for the existing bus stop. 2 signs and 1 tree need to be relocated. 1 fire hydrant and water line are in conflict. Potential electric conflict. The platform could be an unconstrained platform on the nearside of the intersection. There is plenty of room and no above ground utilities shown. Fire hydrant just south of location marked up on plans.
S300	0217	Park Street	IB	W. Washington Avenue	Small	Curbside	Farside	Farside	60	No	25	Unconstrained	One sign and one tree to be removed. One storm sewer inlet in close proximity to platform. Storm pipe could be in conflict.
S400	0251	Park Street	IB	Erin Street	Small	Curbside	Farside	Farside	60	No	9	Constrained	Building near ROW. ROW is needed to allow 12' platform. There appears to be enough room to buy additional ROW for the platform but not much more. One sign would need to be relocated.
S500	0107	Park Street	IB	Olin Avenue	Small	Curbside	Farside	Farside	60	No	9	Constrained	Gas station behind ROW. ROW will be needed to allow 12' platform. This may impact functionality of the gas station due to location of pumps. One driveway would need to be closed so that a 60' long platform can at this intersection. If the driveway closest to the intersection was closed, the gas station would still have one driveway on Olin and one on Park.
S600	0745	Park Street	IB	Wingra Creek	Small	Curbside	Farside	Farside	60	No	12	Unconstrained	One sign to be removed. ROW will likely be needed to allow a 12' platform. There appears to be enough land in the area to allow the 12' platform.
S700		Park Street	IB	Bram Street	Small	Curbside		Midblock	60	Yes	5	Constrained	Building and brick staircase at this location. ROW will be needed to allow a 12' platform. There is a MH in the area so there may be a utility conflict. Street light electrical feed is likely a conflict.
S800	0475	Park Street	IB	Villager Mall	Small	Curbside		Nearside	60	No	8	Unconstrained	Overhead and underground electric is in conflict. ROW will need to be purchased at this location to allow a 12' platform.
S900		Badger Road	IB	South Transfer Point									
S1000	0353	Badger Road	IB	Badger Road	Small	Curbside	Nearside	Nearside	60	No	12	Unconstrained	Located approximately 100' from the Fish Hatchery Rd on Badger Rd. there are 3 trees and a electrical pole located in the footprint of the proposed station. Station is located away from the intersection to mitigate driveway conflicts.
S1100	4449	Fish Hatchery Road	IB	Greenway Cross	Small	Curbside	Nearside	Nearside	60	No	12	Unconstrained	ROW is likely needed depending on ROW line location.
S1200	4523	Fish Hatchery Road	IB	Post Road	Small	Curbside	Nearside	Nearside	60	No	10	Unconstrained	ROW may be needed depending on ROW line location. One overhead electric pole and one telephone box are in conflict.
S1300	4941	Fish Hatchery Road	IB	Caddis Bend	Small	Curbside	Farside	Farside	60	No	36	Unconstrained	One sign will need to be removed.
S100	0538	Park Street	OB	Park Street (between Uni. & Johnson)	Large	Curbside	Nearside	Farside	60	No	23	Unconstrained	One tree and two signs to be relocated. Potential water line and elect. Unconstrained up to 23'. Two signs to be relocated and electrical line conflict. Electrical line conflict due to proximity of fire hydrant and street lights.
S200	0546	Park Street	OB	Regent Street	Small	Curbside	Farside	Farside	60	No	12	Unconstrained	One sign to be relocated. Above ground electric box and feeds in conflict. Fire hydrant located directly north of the platform - water line may be in conflict. ROW is close and may be needed. The bus lane taper may need to be shifted to meet City criteria.
S300	0840	Park Street	OB	W. Washington Avenue	Small	Curbside	Nearside	Nearside	60	No	15	Unconstrained	One sign to be relocated. Overhead electric lines and underground electric in conflict. A 60' platform will not fit at this location without modifying/closing a driveway. The gas station has 4 existing driveways (2 on Park and 2 on Vilas). Recommend closing closest driveway to the intersection because it is at an unsafe distance to the intersection. It doesn't appear that a 12' platform would fit as a farside platform due to the buildings adjacent to the ROW.
S400	0288	Park Street	OB	Erin Street	Small	Curbside	Farside	Farside	60	No	16	Constrained	Building under construction in Google street view so it is unknown if this site is constrained or unconstrained. One tree and one sign to be removed. One street light and associated electrical feed is in conflict. Existing bus shelter and furniture will need to be removed.
S500	0360	Park Street	OB	Olin Avenue	Small	Curbside	Nearside	Nearside	60	Yes	8	Constrained	Building behind ROW. ROW is needed at this location to allow a 12' wide platform. There appears to be enough room between the street and the building to put a 12' platform. One sign and one brick wall will need to be removed. There is one overhead power pole in conflict.
S600	0124	Park Street	OB	Wingra Creek	Small	Curbside	Farside	Farside	60	No	11	Unconstrained	One sign will need to be relocated. ROW will be needed to allow a 12' platform. The car dealer may need to be reconfigured after ROW purchase but there appears to be enough land. It appears that a nearside platform could be used at this location with a cheaper ROW impact since the property is currently vacant.
S700		Park Street	OB	Bram Street	Small	Curbside		Midblock	60	Yes	5	Unconstrained	Unconstrained but there is limited ROW to purchase without impacting the businesses at the site behind the ROW. ROW will need to be purchased to allow a 12' platform. This may severely impact the parking at this facility.
S800	0906	Park Street	OB	Villager Mall	Small	Curbside		Farside	60	No	9	Unconstrained	One sign would need to be removed. ROW will need to be purchased to allow for a 12' platform. There appears to be plenty of land in this area. Due to the fire hydrant nearby, there may be a water line conflict.
S900	4100	Badger Road	OB	South Transfer Point	TP - Large	TP	N/A	N/A	TP			Unconstrained	
S1000	0782	Badger Road	OB	Badger Road	Small	Curbside	Nearside	Nearside	60	No	12	Unconstrained	Located between Fish Hatchery and Catalpa Rd on Badger Rd. This located is unconstrained with a 12' sidewalk/blvd width. The station should be located near Catalpa Rd to use the grass area between the intersection and the driveway to the buildings adjacent. This driveway may need to be closed, but two other access driveways are available for this parking area. 2 trees are also located in the station footprint.
S1100	4622	Fish Hatchery Road	OB	Greenway Cross	Small	Curbside	Farside	Farside	60	No	9	Unconstrained	ROW is likely needed depending on ROW line location. One sign to be removed. One overhead electric pole, one telephone box and associated wires, and 2 storm sewer inlets and the storm pipes are in conflict.
S1200	4752	Fish Hatchery Road	OB	Post Road	Small	Curbside	Nearside	Nearside	60	No	12	Unconstrained	Unconstrained but limited ROW available without impacting gas station operations. ROW may be needed depending on ROW location. 2 storm sewer inlets and 1 manhole in conflict.
S1300	4699	Fish Hatchery Road	OB	Caddis Bend	Small	Curbside	Farside	Nearside	60	No	16	Unconstrained	2 signs and 1 tree will need to be relocated. There may be electric in conflict.

CENTRAL

Study Station ID	Stop ID	On Street	Direction	Station Name	Final Shelter Size	Platform Type	Initial Platform Location	Final Platform Location	Platform Length	On-Street Parking Impacts	Existing Sidewalk/Blvd Width*	Constrained/Unconstrained Site	Notes
C100	455	Johnson Street	IB	Park Street (@ Johnson St.)	Large	Curbside	Farside	Farside	60	No	20	Unconstrained	There are 2 existing bus stop shelters and bench located in the area needed for this to be a unconstrained station. The station should be located >10 East of the end of the curve radius to reduce impact on a existing fire hydrant.
C200	555	Johnson Street	IB	Bassett Street	Medium	Curbside	Farside	Farside	60	No	12	Constrained	Proposed station location will need to close one driveway access to building alley/parking lot. Building has two access points and this is the smaller of the two. Also 2 trees and 1 street light pole are located within the proposed station footprint.
C300	883	State Street	IB	State Street	Existing								Existing bus shelter. State and Fairchild (EB)
C400	1100	Capitol Square	IB	Capitol Square North	Existing								Existing Bus Shelter. Mifflin and Carroll (SB)
C500	1101	Capitol Square	IB	Capitol Square South	Existing								Existing bus shelter. Main and Carroll (EB).
C600	1323	East Washington	IB	Webster Street	Medium	Curbside	Farside	Farside	60	No	12	Unconstrained	There is a existing bus stop shelter, manhole, and Light pole with stop light within the proposed station footprint. Also a raised grass and tree landscape may need to be cut back to accommodate a unconstrained station. Proposed station will need to begin where the crosswalk matches the sidewalk in order to mitigate impact on the parking lot driveway to the West.
C700	1214	East Washington	IB	Blair Street	Small	Curbside	Nearside	Nearside	60	No	14	Unconstrained	Proposed station footprint includes a light pole, handhole/manhole, and a tree. A row of shrubs may need to be removed to allow for a unconstrained station.
C800	1660	East Washington	IB	Paterson Street	Medium	Curbside	Farside	Farside	60	No	12	Unconstrained	Existing bus stop landing and 1 tree are located in the proposed station footprint. Station would extend right up to the ROW line of the existing car lot, may need to purchase 1-2 feet of ROW. Also existing Bike Only lane runs in the outside lane where bus would stop at station. ROW would need to be purchased to allow unconstrained station. This would take away a strip of the existing parking lot.
C900	1730	East Washington	IB	Baldwin Street	Small	Curbside	Farside	Farside	60	No	10	Constrained	The distance from existing curb to face of building is only 10 . Also there is a light pole, traffic light, sign , and tree in the proposed station footprint.
C100		University	OB	Park Street (@ Johnson St.)	Large	Curbside	Farside	Farside	60	No	15	Unconstrained	Two trees located in the proposed station footprint. Existing bus lane located in outside lane where bus would stop for station.
C200	428	University	OB	Bassett Street	Large	Curbside	Farside	Farside	60	No	12	Constrained	A fire hydrant and street sign are located in the proposed station footprint. Existing bus lane located in outside lane where bus would stop for station. Station located right after corner to mitigate impact on parking lot driveway to the West.
C300	1588	State Street	OB	State Street	Existing								Existing bus shelter. State and Dayton (WB).
C400		Capitol Square	OB	Capitol Square North	Existing								Existing Bus Shelter. Mifflin and Carroll (WB)
C500		Capitol Square	OB	Capitol Square South	Existing								Existing bus shelter. Main and Pinckney (EB).
C600	1618	East Washington	OB	Webster Street	Medium	Pull-out	Midblock	Midblock	60	No	12	Constrained	Existing pull-out bus stop in the same location.
C700	1579	East Washington	OB	Blair Street	Small	Curbside	Nearside	Nearside	60	No	16	Unconstrained	There is a fire hydrant, sign, and tree located in the proposed station footprint. A row of shrubs may need to be removed to allow for a unconstrained station.
C800	1565	East Washington	OB	Paterson Street	Medium	Curbside	Farside	Farside	60	No	10	Constrained	Multiple signs and 1 light pole is located in the proposed station footprint. Sidewalk narrows close to the intersection to 10 and then widens to 12 as you go East along Washington.
C900	1883	East Washington	OB	Baldwin Street	Small	Curbside	Farside	Farside	60	No	12	Constrained	Proposed station to be offset 60 to the East from stop bar of intersection (20 from existing bus stop landing edge) to allow for 12 wide sidewalk/Blvd. There are 2 trees and 1 sign locate in the proposed station footprint.

SUMMARY	**SIZE**					**PLATFORM**				**LOCATION**					**PLATFORM LENGTH**		
	SMALL	**MEDIUM**	**LARGE**	**TP - Large**	**TOTAL**	**CURBSIDE**	**PULL-OUT**	**TP**	**TOTAL**	**FARSIDE**	**NEARSIDE**	**MIDBLOCK**	**N/A**	**TOTAL**	**60**	**TP**	**TOTAL**
East	12	3	4	0	**19**	19	0	0	**19**	11	7	0	1	**19**	19	0	**19**
West	13	2	10	1	**26**	25	0	1	**26**	19	6	0	1	**26**	25	1	**26**
West-Odana	6	0	1	1	**8**	7	0	1	**8**	4	2	0	2	**8**	7	1	**8**
North	6	2	2	1	**11**	10	0	1	**11**	6	4	0	1	**11**	10	1	**11**
South	21	0	2	1	**24**	23	0	1	**24**	12	9	2	1	**24**	23	1	**24**
Central	4	5	3	0	**12**	11	1	0	**12**	9	2	1	0	**12**	12	0	**12**
TOTAL	**62**	**12**	**22**	**4**	**100**	**95**	**1**	**4**	**100**	**61**	**30**	**3**	**6**	**100**	**96**	**4**	**100**

	SMALL 60		**MEDIUM 60**		**LARGE 60**		**TP - LARGE**
	CURBSIDE	**PULL-OUT**	**CURBSIDE**	**PULL-OUT**	**CURBSIDE**	**PULL-OUT**	**TP**
East	12	0	3	0	4	0	0
West	13	0	2	0	10	0	1
West-Odana	6	0	0	0	1	0	1
North	6	0	2	0	2	0	1
South	21	0	0	0	2	0	1
Central	4	0	4	1	3	0	0
TOTAL	**62**	**0**	**11**	**1**	**22**	**0**	**4**

	60			
	CURBSIDE	**PULL-OUT**	**TP**	**TOTAL**
East	19	0	0	19
West	25	0	1	26
West-Odana	7	0	1	8
North	10	0	1	11
South	23	0	1	24
Central	11	1	0	12
TOTAL	**95**	**1**	**4**	**100**

	CONSTRAINED	**UNCONSTRAINED**	**TOTAL**
East	5	14	19
West	7	19	26
West-Odana	0	8	8
North	1	10	11
South	6	18	24
Central	6	6	12
TOTAL	**25**	**75**	**100**

Madison BRT Transit Corridor Study
Proposed BRT Operations Plans

This paper presents a description of the proposed BRT operations plan for use in the Madison BRT Transit Corridor Study. The objective is to develop reasonable assumptions on BRT and supporting bus service plans, for use in travel demand modeling/ridership forecasts, fleet sizing and estimating daily and annual revenue bus-hours of service, for use in O&M cost estimation. The operations plan presented in this paper does not any include any expansion or modifications of Metro service beyond what has been identified to accommodate and complement the proposed BRT system.

BRT Corridors

BRT alignments and station locations have been defined for the following four corridors:

- North Corridor – generally along Sherman Avenue, with a northern end-of-line BRT station at Warner Park
- East Corridor – generally along East Washington Avenue, with a mid-route deviation to Madison College, and with an eastern BRT end-of-line station at East Towne Mall
- South Corridor – generally along Park Street, Badger Road and Fish Hatchery Road, with a southern end-of-line BRT station at Caddis Bend
- West Corridor – generally along University Avenue, Whitney Way and Mineral Point Road, with a western BRT end-of-line station at High Point Road. An alternative West Corridor alignment utilizes Odana Road to the West Towne Mall area

All four corridors are connected to a Central Corridor alignment through the Isthmus. From east to west, the Central Corridor alignment begins at East Washington Avenue/Baldwin Street, follows East Washington Avenue to Capitol Square, and continues west on State Street and Gorham Street/University Avenue (Johnson Street for eastbound buses) to Park Street.

Maps of each corridor alignment are provided in this paper's Appendix.

BRT Operating Hours and Frequencies

Proposed BRT operating hours and service frequencies by time period are noted below in Table 1.

Table 1
Proposed BRT Operating Hours and Frequencies

Day of Week	Time Period	Hours	Service Freq.
Weekday	Early AM	5:00-6:00 a.m.	30 min.
	AM Peak	6:00-9:00 a.m.	10 min.
	Midday	9:00 a.m.-3:00 p.m.	15 min.
	PM Peak	3:00 p.m.-6:00 p.m.	10 min.
	Evening	6:00 p.m.-12 Midnight	30 min.
Saturday	Morning	7:00-9:00 a.m.	30 min.
	Midday	9:00-6:00 p.m.	15 min.
	Evening	6:00-11:00 p.m.	30 min.
Sunday	Morning	7:00-9:00 a.m.	30 min.
	Midday	9:00-7:00 p.m.	30 min.
	Evening	7:00-11:00 p.m.	30 min.

Annual service statistics (revenue bus-hours and revenue bus-miles of service) will be based on 255 weekdays, 52 Saturdays and 58 Sundays and holidays (holidays will be treated as Sundays). BRT vehicle requirements by time period will be based on a cycle time that reflects the estimated route travel time and layover time, which will be no less than 15 percent of the route travel time.

It is important to note that the service frequencies identified in Table 1 reflect an initial proposed service plan. This table corresponds with the existing service span for Metro Transit. Ridership forecasts will be reviewed to determine if these assumptions should be modified.

BRT Vehicles

The proposed BRT vehicle is an articulated bus. The specific type of bus and propulsion system (e.g., hybrid electric) is yet to be determined. For purposes of the service plan, it is assumed each articulated BRT bus has a seating capacity for 58 passengers, and a standing capacity for an additional 22 passengers, for a total capacity of 80 passengers. These articulated bus capacity figures are consistent with those recently used by Palm Tran in a recent acquisition of New Flyer articulated buses.

BRT Service Patterns

It is proposed that BRT service be interlined through downtown, to avoid the need to provide physical space for buses to layover at Capitol Square, and to eliminate transfer time at Capitol Square for through riders. Layovers will occur at each corridor's outer end-of-line station. For purposes of this study, it is assumed that the North and South Corridors are interlined, and the East and West Corridor are interlined. This routing pattern combines what is anticipated to be the two most heavily used corridors (east and west). However, with all four corridors, other interline combinations are possible.

BRT bus operations can be restricted to service just along the defined BRT corridors (e.g., Caddis Bend to Warner Park and East Towne Mall to High Point) or the BRT buses can continue beyond the end-of-line stations to adjacent neighborhoods and nearby destinations. The first option (service restricted to the defined BRT corridors) reduces the number of BRT buses that need to be purchased, avoids the possible use of large articulated buses in residential neighborhoods, and strengthens the BRT brand. The second option reduces passenger transfer requirements at the end-of-line stations and creates more one-seat ride opportunities for passengers located beyond the BRT alignments.

The operating plan defined for this study assumes BRT buses continue beyond the end-of-line station on just the North Corridor because of possible service efficiencies to be gained in that area. Alternating BRT trips would continue to either the Dane County Regional Airport or to Troy Drive/Northport (Route 22). Further analysis of trade-offs will be needed in future studies to determine if this is the preferred operating plan, or if BRT should advance beyond the end-of-line station in any other corridors.

Figure 1 presents a schematic of the proposed route patterns. The East/West pattern is shown in Red, and the North/South pattern is shown in Blue, with two patterns shown for the North/South pattern (to/from the Airport is shown as Blue-A and to/from Troy Drive is shown as Blue-B).

Table 2 presents bus requirements by time period for the Mineral Point Road alignment on the East/West (Red) Line. This table presents estimated round trip travel times, layover times, cycle times and bus requirements by time period (am and pm peaks, midday and evening). A 15 percent layover has been assumed (i.e., layover/recovery time should be approximately 15 percent of the total cycle time). It is important to note that sometimes layover percentages can be in excess of 15% because the travel time does not fit will into a cycle (e.g., a 55-minute round trip travel time and a 15-minute service frequency cannot fit within a 60-minute cycle, for that would only achieve an 8% recovery percentage. Thus, a 75-minute cycle is required, resulting in a 27% recovery percentage). Note that this analysis is based on preliminary travel time estimates. Service frequencies, recovery times and cycle times should be reviewed and updated as this project advances and new BRT travel times are calculated. At such time, it may be possible to tighten recovery percentages.

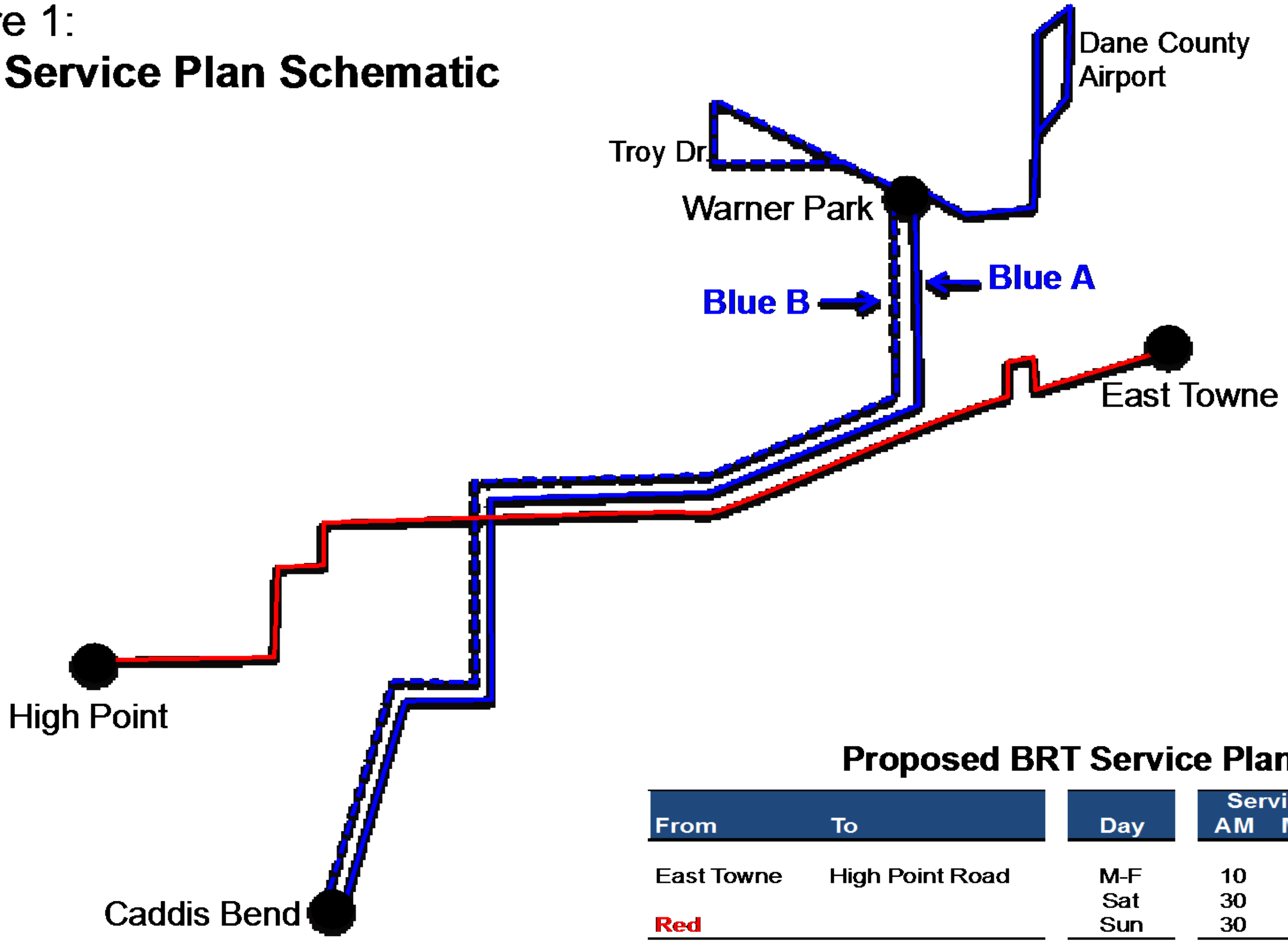
Peak bus requirements by corridor are as follows:

- East – 6 buses
- North – 6 buses
- South – 7 peak buses
- West: Both alignment options – 9 peak buses

Overall, 28 peak buses are required for the entire system, as shown in Table 2. Using a 20% spare bus ratio, required fleet buses for the full BRT system are 34 buses. The Odana Road alignment option has the same peak/fleet bus requirement as the Mineral Point Road alignment option that is presented in Table 2.

Table 3 presents daily and annual estimates of annual revenue bus-hours and bus-miles of service for the full BRT system, for both West Corridor alignment options. Both scenarios have the same estimate of annual revenue bus-hours. Bus-miles vary slightly because of the longer alignment associated with the Odana Road alignment option.

Figure 1:
BRT Service Plan Schematic



Proposed BRT Service Plan

From	To	Day	Service Frequency AM	Mid	PM	Eve
East Towne	High Point Road	M-F	10	15	10	30
		Sat	30	15	15	30
Red		Sun	30	30	30	30
Caddis Bend	Warner Park/ Airport	M-F	20	30	20	60
		Sat	60	30	30	60
Blue (A)		Sun	60	60	60	60
Caddis Bend	Warner Park/ Troy Drive	M-F	20	30	20	60
		Sat	60	30	30	60
Blue (B)		Sun	60	60	60	60

Table 2
Cycle Times and Bus Requirements by Time Period and Day of Week
Mineral Point Road Alignment Option

AM and PM Peak Time Periods

Route	From	To	Day	Serv. Freq.	Rnd Trip Time (min)	Total Layover	Cycle Time	Layover Percent	Bus Req't.
East/West **Red**	East Towne Mall	High Point Road	M-F	10	124.17	25.83	150.00	17%	15
			Sat	30	124.17	25.83	150.00	17%	5
			Sun	30	124.17	25.83	150.00	17%	5
North/South **Blue (A)**	Caddis Bend	Warner Park/ Airport	M-F	20	107.80	22.20	130.00	17%	6.5
			Sat	60	107.80	42.20	150.00	28%	2.5
			Sun	60	107.80	42.20	150.00	28%	2.5
North/South **Blue (B)**	Caddis Bend	Warner Park/ Troy Drive	M-F	20	112.60	17.40	130.00	13%	6.5
			Sat	60	112.60	37.40	150.00	25%	2.5
			Sun	60	112.60	37.40	150.00	25%	2.5

Total Bus Req't. for Period		
	M-F	28
	Sat	10
	Sun	10

Midday Time Period

Route	From	To	Day	Serv. Freq.	Rnd Trip Time (min)	Total Layover	Cycle Time	Layover Percent	Bus Req't.
East/West **Red**	East Towne Mall	High Point Road	M-F	15	124.17	25.83	150.00	17%	10
			Sat	15	124.17	25.83	150.00	17%	10
			Sun	30	124.17	25.83	150.00	17%	5
North/South **Blue (A)**	Caddis Bend	Warner Park/ Airport	M-F	30	107.80	27.20	135.00	20%	4.5
			Sat	30	107.80	27.20	135.00	20%	4.5
			Sun	60	107.80	42.20	150.00	28%	2.5
North/South **Blue (B)**	Caddis Bend	Warner Park/ Troy Drive	M-F	30	112.60	22.40	135.00	17%	4.5
			Sat	30	112.60	22.40	135.00	17%	4.5
			Sun	60	112.60	37.40	150.00	25%	2.5

Total Bus Req't. for Period		
	M-F	19
	Sat	19
	Sun	10

Evening Time Period

Route	From	To	Day	Serv. Freq.	Rnd Trip Time (min)	Total Layover	Cycle Time	Layover Percent	Bus Req't.
East/West **Red**	East Towne Mall	High Point Road	M-F	30	124.17	25.83	150.00	17%	5
			Sat	30	124.17	25.83	150.00	17%	5
			Sun	30	124.17	25.83	150.00	17%	5
North/South **Blue (A)**	Caddis Bend	Warner Park/ Airport	M-F	60	107.80	42.20	150.00	28%	2.5
			Sat	60	107.80	42.20	150.00	28%	2.5
			Sun	60	107.80	42.20	150.00	28%	2.5
North/South **Blue (B)**	Caddis Bend	Warner Park/ Troy Drive	M-F	60	112.60	37.40	150.00	25%	2.5
			Sat	60	112.60	37.40	150.00	25%	2.5
			Sun	60	112.60	37.40	150.00	25%	2.5

Total Bus Req't. for Period		
	M-F	10
	Sat	10
	Sun	10

Fleet Bus Requirement for Full BRT System = 34 (20% spare ratio factor)

NOTE: Odana Road alignment option has same peak/fleet bus requirements

Table 3
Estimates of Bus-Hours and Bus-Miles of Service

Mineral Point Road Alignment Option for East/West Line

		One-Way			Service Frequency				Daily Rev.		Annual Rev.	
From	To	Time (min)	Dist (mi)	Day	AM	Mid	PM	Eve	Bus-Mi's	Bus-Hrs	Bus-Miles	Bus-Hrs
East Towne	High Point Road	62.08	14.04	M-F	10	15	10	30	2,078	185	529,900	47,200
				Sat	30	15	15	30	1,460	130	75,900	6,800
Red				Sun	30	30	30	30	899	80	52,100	4,600
Caddis Bend	Warner Park/ Airport	53.90	11.41	M-F	20	30	20	60	844	84	215,300	21,300
				Sat	60	30	30	60	593	60	30,900	3,100
Blue (A)				Sun	60	60	60	60	365	40	21,200	2,300
Caddis Bend	Warner Park/ Troy Drive	56.30	12.01	M-F	20	30	20	60	889	84	226,600	21,300
				Sat	60	30	30	60	625	60	32,500	3,100
Blue (B)				Sun	60	60	60	60	384	40	22,300	2,300
TOTALS											1,206,700	112,000

OdanaRoad Alignment Option for East/West Line

		One-Way			Service Frequency				Daily Rev.		Annual Rev.	
From	To	Time (min)	Dist (mi)	Day	AM	Mid	PM	Eve	Bus-Mi's	Bus-Hrs	Bus-Miles	Bus-Hrs
East Towne	High Point Road	65.08	14.89	M-F	10	15	10	30	2,204	185	561,900	47,200
				Sat	30	15	15	30	1,549	130	80,500	6,800
Red				Sun	30	30	30	30	953	80	55,300	4,600
Caddis Bend	Warner Park/ Airport	53.90	11.41	M-F	20	30	20	60	844	84	215,300	21,300
				Sat	60	30	30	60	593	60	30,900	3,100
Blue (A)				Sun	60	60	60	60	365	40	21,200	2,300
Caddis Bend	Warner Park/ Troy Drive	56.30	12.01	M-F	20	30	20	60	889	84	226,600	21,300
				Sat	60	30	30	60	625	60	32,500	3,100
Blue (B)				Sun	60	60	60	60	384	40	22,300	2,300
TOTALS											1,246,500	112,000

Background Bus Service Modifications

The introduction of BRT service provides opportunities to restructure the background Metro bus service. Specific weekday route alignment and frequency changes that have been assumed for this study are described below. It is important to note that the service modifications described below reflect a *potential* restructuring of service for purposes of estimating ridership and cost impacts. Further planning with extensive public involvement will be required should this project advance towards implementation. As an example, route modifications will impact existing Metro interlines. Those impacts, and proposed adjustments to existing route interlines have not been addressed in detail at this stage of the project.

North Transfer Point Routes – It is proposed that Metro's North Transfer Point be relocated to Aberg Avenue and Sherman Avenue, to provide connectivity to proposed North Corridor BRT service. Thus, alignments for all routes that serve the North Transfer Point will need to be modified to operate to and from this new location (Routes 2, 4, 17, 20, 21, 28, 56, 57). Run times will eventually need to be reviewed to determine if required alignment modifications can be accommodated within existing cycle times, or if new interline options need to be considered to mitigate additional bus requirements.

West Transfer Point Routes – There are two BRT alignment options for the West Corridor. The Odana Road alignment option assumes the West Transfer Point remains at its current location. The Mineral Point alignment option, however, assumes the West Transfer Point is relocated to the vicinity of Mineral Point Road and Whitney Way (i.e., along the BRT alignment). Thus, alignments for all routes that serve the West Transfer Point will need to be modified to operate to and from this new location (Routes 2, 3, 6, 11, 12, 18, 28, 50, 51, 52, 55, 56, 57 and 73, in addition to weekend routes 7, 59, 63, 68 and 78). Run times will need to be reviewed to determine if required alignment changes can be accommodated within existing cycle times, or if new interline options need to be considered to mitigate additional bus requirements. As an example, it is known that Route 7 (a weekend route) currently has minimal recovery time at the West Transfer Point. Relocation of the West Transfer Point will require additional travel time for Route 7. An additional bus will probably be required on this route. Route 18 may also be adversely impacted, requiring an additional bus to maintain current frequencies.

Route 2 – This route operates between the West and North Transfer Points, with 30-minute all-day service, both weekdays and weekends. There is supplemental morning peak service between the West Transfer Point and downtown Madison. It is proposed that the supplemental a.m. peak trips be eliminated because they are duplicative of the new BRT service.

Route 5 – This route operates between the South and East Transfer Points. Weekday frequencies are 30-minutes during the day and 60-minutes in the evening. Weekend frequencies are 60-minutes all-day. It is proposed that the south portion of this route (between the South Transfer Point and downtown Madison) be eliminated and replaced with the BRT line. This change would eliminate service on the Fisher St deviation 1-2 blocks east of Park St, but high quality BRT service would be available on Park St. The elimination of service on the south side of downtown results in the need to consider interline options for Route 5. A possible interline option includes the revised Route 6 (described below).

Route 6 – This route operates from West Transfer Point through downtown Madison, to East Towne Mall, with alternating trips serving several different patterns. Existing weekday frequencies are 15 peak/30 midday and evening. Existing weekend frequencies are hourly. It is proposed the eastern portion of this route (east of downtown Madison) be eliminated, replaced with BRT service. As noted above, with elimination of Route 6 service east of downtown, new interline options may need to be considered, such as with Route 5. The resulting Route 6 west / Route 5 east line would operate from the West Transfer Point to East Transfer Point with 30-minute service throughout the day on weekdays, hourly service on weekends. The route would pulse at the East Transfer Point at 15 and 45 minutes after the hour, but would not coincide with the pulse at the West Transfer Point.

Route 13 – This route operates from the South Transfer Point to the UW Campus. Route 13's weekday frequencies are 30 peak/60 midday and 60 evening. Existing weekend frequencies are hourly. With the introduction of BRT service, it is proposed this route's northern alignment be modified to downtown Madison via West Washington Avenue (to replace lost Route 5 service on West Washington Avenue). It is also proposed Route 13 continue northeast on East Washington Avenue to Milwaukee Street, to provide supplemental local service under the proposed BRT service.

Route 14 – This route operates between Tree Lane and Gammon Road and downtown Madison, with peak trips continuing to the East Transfer Point and Cottontail Trail and Kings Mill Way. Weekday frequencies are 30-minutes in the peak and 60-minutes in the midday and evening periods. It is proposed this route's alignment be modified slightly, to remain on Regent Street instead of deviating to Sheboygan Avenue to reduce travel times and take advantage of the frequent service provided by BRT.

Route 20 – This route operates from the North Transfer Point, to the Dane County Regional Airport, to East Towne Mall. Existing frequencies are 30-minutes all-day – both weekdays and weekends. It is proposed that the airport portion of this alignment be eliminated. It is also proposed this route's alignment be modified to pick up service on Kinsman Blvd. and Bartillon Road, and on Portage Road and Hayes Road (to pick up service lost with the proposed elimination of Route 6 on the east side).

Route 22 – This route operates from the North Transfer Point to Troy Drive and Green Avenue. Existing weekday frequencies are 15 peak/30 midday and 30 evening. Existing weekend frequencies are 60 minutes. This route is proposed for elimination, to be replaced with extended BRT service (every other trip). The extended BRT trips could continue to be labeled as Route 22 service, or as labeled BRT service.

Route 25 – This route presently has two a.m. outbound and two p.m. inbound trips between downtown Madison and The American Center. This route is eliminated, replaced with all-day Route 26 service.

Route 26 – This route presently operates hourly in the midday between East Towne Mall and The American Center. This route is modified to operate during peaks as well as the midday with 30-minute peak headways, connecting to BRT service at the East Towne Mall.

Route 27 – This route provides peak period service between the North Transfer Point and downtown Madison and the UW campus. It is proposed this route be eliminated because most of its service area is duplicative of BRT. It is important to note that this route serves East High School trips. Thus, supplemental service (trippers) may be needed at the start and end of school to accommodate high school passenger loads.

Route 29 – This route, known as the Sherman Flyer, provides 2 a.m. inbound and 2 p.m. outbound trips from the Lakeview area to downtown Madison and the UW campus. It is proposed this route be eliminated because it is duplicative of BRT service. Route 21 presently serves a large portion of this route's service area.

Route 34 – This route presently operates between the East Transfer Point and the Madison College. Existing frequencies are 30-minutes in the peak period and 60-minutes in the midday, with service on weekdays only. It is proposed that this route's alignment be modified to include service on East Washington Avenue. From Kinsman Blvd., the route would follow North Stoughton Road to East Washington, turning south on Fair Oaks Avenue.

Route 37 – This route operates from the east side of Madison (east of Lake Monona) to downtown Madison and the UW Campus. Select afternoon trips (3 trips) continue to Sheboygan Avenue and Eau Claire Avenue. It is proposed that those 3 trips do not continue to Sheboygan Avenue/Eau Claire Avenue.

Routes 44 and 48 – These routes provide weekday peak period service between Fitchburg and the UW Campus. These route alignments are modified to begin/end at the Caddis Bend BRT station. Thirty-minute service is proposed in the peak periods only.

Route 47 – This route operates from Fish Hatchery Road/Caddis to the UW Campus and downtown Madison. This route operates in the peak periods only, at 30-minute frequencies in both directions. It is proposed that this route's alignment be shifted from Park Street to Mills Street to replace frequency vacated by the 44/48 and reduce duplicative service.

Route 67 – This route operates from Mineral Point/Randolph Drive to the West Transfer Point. Existing weekday frequencies are 15 peak/30 midday/30 evening. Existing weekend frequencies are 60-minutes. It is proposed this route be eliminated because it is duplicative of the West Corridor Mineral Point Road BRT line and Route 14. If the Odana Road Routing is chosen for the West Corridor, Route 73 is planned to be rerouted to Mineral Point Road to provide local service, as described below.

Route 70 – This route operated from Middleton and the UW Health Center in Middleton to Capital Square via University Avenue. Route 70 generally operates in the midday and evening periods at approximately 60-minute frequencies. It is proposed Route 70 be modified to truncate at Hill Farms (University Avenue and Segoe Road), with minor improvements in frequencies to accommodate the route's new travel time while maintaining two buses in service. No changes are proposed to Routes 71, 72 and 74, which provide peak period service in this corridor.

Route 73 – This route operates from the Middleton Transfer Point to the West Transfer Point. Existing weekday frequencies are 30-minutes in the peak period and 60-minutes in the midday and evening periods. No changes are proposed to this route should the West BRT alignment utilize Mineral Point Road. It is proposed that this route's alignment be modified from Odana Road to Mineral Point Road should the West BRT alignment utilize Odana Road (see Route 67 description). Note that Odana Road is served by Route 63 on the weekends. This alignment change is also proposed to weekend Route 63 service.

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APPENDIX
CORRIDOR BRT ALIGNMENT MAPS

(Will be inserted in final draft)

Capital Area Regional Planning Commission
BRT Transit Corridor Study

TSP Slack Time Analysis

December 3, 2012

Prepared by the
SRF Consulting Group Team

TSP Slack Time Analysis

SRF has completed a preliminary analysis of the potential benefit of Transit Signal Priority (TSP) at the intersections along the proposed Arterial Bus Rapid Transit (BRT) routes in Madison. Of the total 102 signalized intersections along the corridor, four are exempt railroad crossings and seven were unable to be analyzed do to complex, non-standard phasing, therefore slack time was analyzed at each of the remaining 91 intersections. This analysis is a first step toward the goal of determining whether TSP will be a beneficial tool for improving bus travel time on the proposed BRT routes.

The intent of this first stage of the analysis is to determine where slack time is available on non-TSP phases that could be transferred to TSP phases. Along the BRT route, at intersections where the proposed BRT movement is already receiving as much green time as possible, TSP will not be able to provide additional benefit. This initial analysis identifies these intersections in order to remove them from further consideration for TSP implementation.

The slack time analysis was performed as follows. First, information on AM peak hour and PM peak hour signal timing plans and settings were provided to SRF by the City of Madison. After receiving the signal controller data, SRF entered the parameters relevant to slack time in a spreadsheet. These parameters included:

- Intersection ID number
- Approach names
- Phases in use
- Type of phase (mainline, cross-street, protected left, protected/permissive left, ped only, etc.)
- Phase-specific timing data:
    - Minimum green time
    - Yellow clearance interval
    - Red clearance interval
    - Walk time
    - Flashing Don’t Walk (ped clearance) interval
- Bus movements (TSP phases)

After performing the data entry for all 91 intersections, calculations were performed in order to identify the amount of slack time on each phase. Once the amount of slack time per phase was determined, the total amount of slack time that could be stolen from non-TSP phases by a TSP phase was calculated. The amount of additional green time was expressed in both seconds and percentage increase from existing. After the amount of potential additional TSP time for each phase was calculated for both the AM and PM peak hours, a “TSP score” for each intersection was derived by averaging the potential percentage increase in green times for each TSP phase across the AM and PM peak hours.

The calculations and output from this analysis are shown in the TSP Slack Time Analysis – Timing Data table details the calculations and the “TSP Slack Time Analysis – Intersection Data” table provides a summary of the analysis results (i.e. TSP score) for each intersection.

On the Intersection Data summary report, each intersection was classified as having High, Medium (Med) or Low TSP Potential. The cutoff points between these categories, like the concept of TSP score itself, are arbitrary. These classifications are intended only to provide an approximate assessment of the potential benefit of TSP at each intersection.

In real terms, a TSP score of 0% indicates that TSP would not be able to provide additional green time for a TSP movement. A TSP score of 100% means that, on average, the green time available for a bus on the proposed BRT route at the given intersection could be increased up to 100% (i.e. doubled) if the other phases were shortened to their minimum durations. The actual amount of additional green time made available for a TSP phase will be subject to limitations based on traffic volume at the intersection.

The calculations performed take into account all required minimum timings, including vehicle and pedestrian. The presence or absence of pedestrian detection or actuation (pushbuttons) can have a large impact on the TSP score for an intersection. In general, intersections were assumed to lack pedestrian detection/actuation unless pushbuttons were visible in a review of site conditions from Google Street View conducted in November, 2012.

As noted on the Intersection Data summary report, TSP scores were not calculated for seven intersections due to complex, non-standard phasing. More information on the operation of these intersections is needed in order to complete the analysis.

After each intersection was classified as High, Medium, or Low, SRF staff worked with Madison Area Transportation Planning Board (MPO) staff to convert these ratings to either a “Yes” meaning the intersection is recommended for further consideration of TSP or a “No” meaning staff do not believe the application of TSP would benefit the Arterial BRT system. Generally, intersections rated High were recommended for further consideration of TSP and intersections rated Low not recommended. Staff applied local knowledge and technical judgment to intersections rated Medium in order to recommend or not recommend TSP at these locations. A full list of the final intersections recommended for TSP recommendations are shown in the “Intersections Recommended for Further Consideration of TSP” table. The attached maps show the locations of each of these intersections.

Next Steps

This analysis is only the preliminary step in the process of exploring how TSP could enhance the performance of an Arterial BRT system in Madison. SRF staff recommends that as one of the initial next steps, the MPO should work with the City of Madison traffic engineering staff to establish a pilot study area for TSP. SRF recommends using a portion of the corridor with a succession of TSP recommended intersections in row that are a combination of both mainline and side streets. Three areas that may work well for a pilot study are shown on the South and West corridor maps.

TSP Slack Time Analysis - Intersection Data

IntID	Area	Streets	Controller	TSP Score	TSP Potential	Notes
1	Capitol Square	/Mifflin//Mifflin//Wisconsin//Wisconsin	ASC/3	18%	Med	
2	Capitol Square	/Mifflin//Mifflin//Webster//Webster	ASC/3	#N/A	#N/A	no TSP phases
3	Capitol Square	/Main//Main/Hamilton/Carroll//Carroll	ASC/3	17%	Med	
4	Capitol Square	State//Mifflin//Carroll//	ASC/2	#N/A	#N/A	non-standard phasing, more info needed
5	Capitol Square	/Washington//Washington//Webster//Webster	ASC/2	62%	High	
6	Capitol Square	/Washington//Washington//Carroll//Carroll	ASC/3	66%	High	
7	Capitol Square	State//State//Fairchild//Dayton/	ASC/2	96%	High	
8	Capitol Square	/Main/King////Pinckney/	ASC/3	23%	Med	
9	Capitol Square	/Washington//Washington//Pinckney//Pinckne	ASC/3	50%	Med	
10	Capitol Square	/Mifflin//Mifflin//Pinckney/Hamilton/Pinckney	ASC/3	1%	Low	
11	East Washington	Washington//Washington//Eagan//Continental	ASC/3	19%	Med	
12	East Washington	Washington//Washington//Lien//-/	ASC/2	10%	Med	
13	East Washington	Washington//Washington//Mendota//Mendota	ASC/2	7%	Low	
14	East Washington	Washington//Washington//Thierer//Portage/	ASC/2	10%	Med	
15	East Washington	Anderson//Anderson//Wright//Wright/	ASC/2	43%	Med	
16	East Washington	Washington//Washington//Baldwin//Baldwin/	ASC/2	11%	Med	WB is overlap A
17	East Washington	Washington//Washington//Blair//Blair/	ASC/2	37%	Med	WB is overlap B
18	East Washington	Washington//Washington//Fair Oaks//Wright/	ASC/2	77%	High	
19	East Washington	Washington//Washington//First//First/	ASC/2	37%	Med	
20	East Washington	Washington//Washington//Fourth//Fourth/	ASC/2	22%	Med	
21	East Washington	Washington//Washington//30 EB//30 EB/	ASC/3	22%	Med	
22	East Washington	Washington//Washington//30 WB//30 WB/	ASC/3	3%	Low	
23	East Washington	Washington//Washington//Ingersoll//Ingersoll/	ASC/2	8%	Low	WB is overlap A
24	East Washington	Washington//Washington//Johnson//Johnson/	ASC/2	7%	Low	
25	East Washington	Washington//Washington//Marquette//-/	ASC/2	0%	Low	WB is overlap A
26	East Washington	Washington//Washington//Milwaukee//North/	ASC/2	13%	Med	
27	East Washington	Washington//Washington//Paterson//Paterson	ASC/3	22%	Med	
28	Fish Hatchery	Emil//Ann//Fish Hatchery//Fish Hatchery/	ASC/2	28%	Med	
29	Fish Hatchery	Badger//Badger//Fish Hatchery//Fish Hatchery/	ASC/3	61%	High	
30	Fish Hatchery	Greenway//Greenway//Fish Hatchery//Fish Hat	ASC/8000	50%	Med	
31	Fish Hatchery	Caddis Bend//Caddis Bend//Fish Hatchery//Fish	ASC/2	131%	High	non-standard phasing
32	Fish Hatchery	EB Beltline//EB Beltline//Fish Hatchery//Fish Ha	ASC/2	43%	Med	
33	Fish Hatchery	Post//-//Fish Hatchery//Fish Hatchery/	ASC/3	31%	Med	
34	Gorham Univ	Gorham//Gorham//Broom//Broom/	ASC/2	0%	Low	
35	Gorham Univ	State/Gorham/State/Gorham////	ASC/2	204%	High	
36	Gorham Univ	University//University//Brooks//-/	ASC/3	3%	Low	
37	Gorham Univ	University//University//Charter//Charter/	ASC/3	10%	Med	
38	Gorham Univ	University//University//Frances//Frances/	ASC/3	4%	Low	
39	Gorham Univ	University//University//Lake//Lake/	ASC/2	#N/A	#N/A	non-standard phasing, more info needed
40	Gorham Univ	University//University//Mills//-/	ASC/3	4%	Low	
41	Gorham Univ	University//University//Orchard//-/	ASC/3	0%	Low	
42	Gorham Univ	University//University//Park//Park/	ASC/2	28%	Med	
43	Gorham Univ	University//University//Randall//Randall/	ASC/3	1%	Low	WB is overlap A
44	Johnson	Campus//Campus//Orchard//Orchard/	ASC/3	2%	Low	
45	Johnson	Campus//Campus//Randall//Randall/	ASC/2	19%	Med	
46	Johnson	Johnson//Johnson//Bassett//Bassett/	ASC/2	6%	Low	
47	Johnson	Johnson//Johnson//Brooks//Brooks/	ASC/3	2%	Low	
48	Johnson	Johnson//Johnson//Broom//Broom/	ASC/2	14%	Med	
49	Johnson	Johnson//Johnson//Frances//Frances/	ASC/2	1%	Low	
50	Johnson	State/Johnson/State/Johnson////	ASC/8000	128%	High	
51	Johnson	Johnson//Johnson//Charter//Charter/	ASC/2	12%	Med	
52	Johnson	Johnson//Johnson//Lake//Lake/	ASC/2	#N/A	#N/A	non-standard phasing, more info needed
53	Johnson	Johnson//Johnson//Mills//Mills/	ASC/2	4%	Low	
54	Johnson	Johnson//Johnson//Park//Park/	ASC/2	3%	Low	non-standard phasing
55	Johnson	University//University//Babcock//Babcock/	ASC/3	0%	Low	
56	Johnson	University//University//Campus//Campus/	ASC/3	#N/A	#N/A	non-standard phasing, more info needed
57	Mineral Pt	Mineral Pt//Mineral Pt//Island//Island/	ASC/8000	0%	Low	

TSP Slack Time Analysis - Intersection Data

IntID	Area	Streets	Controller	TSP Score	TSP Potential	Notes
58	Mineral Pt	Mineral Pt//Mineral Pt//D'Onofrio//D'Onofrio/	ASC/8000	1%	Low	non-standard phasing, WB is OLA
59	Mineral Pt	Mineral Pt//Mineral Pt//Gammon//Gammon/	ASC/2	119%	High	
60	Mineral Pt	Mineral Pt//Mineral Pt//Grand Canyon//Grand	ASC/8000	24%	Med	
61	Mineral Pt	Mineral Pt//Mineral Pt//High Point//High Point,	ASC/8000	48%	Med	
62	Mineral Pt	Mineral Pt//Mineral Pt//Rosa//Rosa/	ASC/8000	7%	Low	
63	Mineral Pt	Mineral Pt//Mineral Pt//Westfield//Westfield/	ASC/8000	86%	High	WB is overlap A
64	Odana	Odana//Odana//Gammon//Gammon/	ASC/8000	182%	High	
65	Odana	Odana//Odana//Grand Canyon//Grand Canyon,	ASC/8000	55%	High	
66	Odana	Odana//Odana//Potomac//Potomac/	ASC/2	22%	Med	
67	Odana	Odana//Odana//Research//Research/	ASC/8000	13%	Med	
68	Odana	Odana//Odana//Tokay//Tokay/	ASC/8000	68%	High	
69	Park	Badger//Badger//Park//Park/	ASC/3	115%	High	
70	Park	Braxton//Braxton//Park//Park/	ASC/2	9%	Low	
71	Park	Buick//Buick//Park//Park/	ASC/3	9%	Low	
72	Park	Erin//Erin//Park//Park/	ASC/2	6%	Low	
73	Park	Fish Hatchery//Fish Hatchery//Park//Park/	ASC/3	0%	Low	
74	Park	Hughes//Hughes//Park//Park/	ASC/2	15%	Med	
75	Park	Regent//Regent//Park//Park/	ASC/2	73%	High	
76	Park	Olin//Olin//Park//Park/	ASC/8000	3%	Low	SB is overlap A
77	Park	Washington//Washington//Park//Park/	ASC/2	9%	Low	non-standard phasing
78	Park	Wingra//Wingra//Park//Park/	ASC/3	#N/A	#N/A	non-standard phasing, more info needed
79	Sherman	Aberg//Aberg//Sherman//Sherman/	ASC/8000	18%	Med	SB is overlap A
80	Sherman	Commercial//Commercial//Sherman//Sherman	ASC/8000	13%	Med	SB is overlap A
81	Sherman	Johnson//Johnson//First//First/	ASC/2	80%	High	
82	Sherman	Johnson//Johnson//Fordem//Fordem/	ASC/3	81%	High	
83	Sherman	Northport//Northport//Sherman//Sherman/	ASC/3	33%	Med	
84	Sherman	Schlimgen//Schlimgen//Sherman//Sherman/	ASC/8000	0%	Low	
85	Univ West	University//University//Farley//Farley/	ASC/3	48%	Med	
86	Univ West	University//University//Midvale//Rose/	ASC/3	12%	Med	
87	Univ West	University//University//Ridge//Ridge/	ASC/3	#N/A	#N/A	non-standard phasing, more info needed
88	Univ West	University//University//Segoe//Segoe/	ASC/3	#N/A	#N/A	non-standard phasing, more info needed
89	Univ West	University//University//Shorewood//Shorewoo	ASC/3	2%	Low	
90	Whitney	Mineral Pt//Mineral Pt//Whitney//Whitney/	ASC/8000	78%	High	NB is OLA, EB is OLC
91	Whitney	Regent//Regent//Whitney//Whitney/	ASC/8000	0%	Low	
92	Whitney	Research//Science//Whitney//Whitney/	ASC/2	0%	Low	non-standard phasing
93	Whitney	Tokay//Tokay//Whitney//Whitney/	ASC/8000	69%	High	

Transit Signal Priority (TSP) Locations

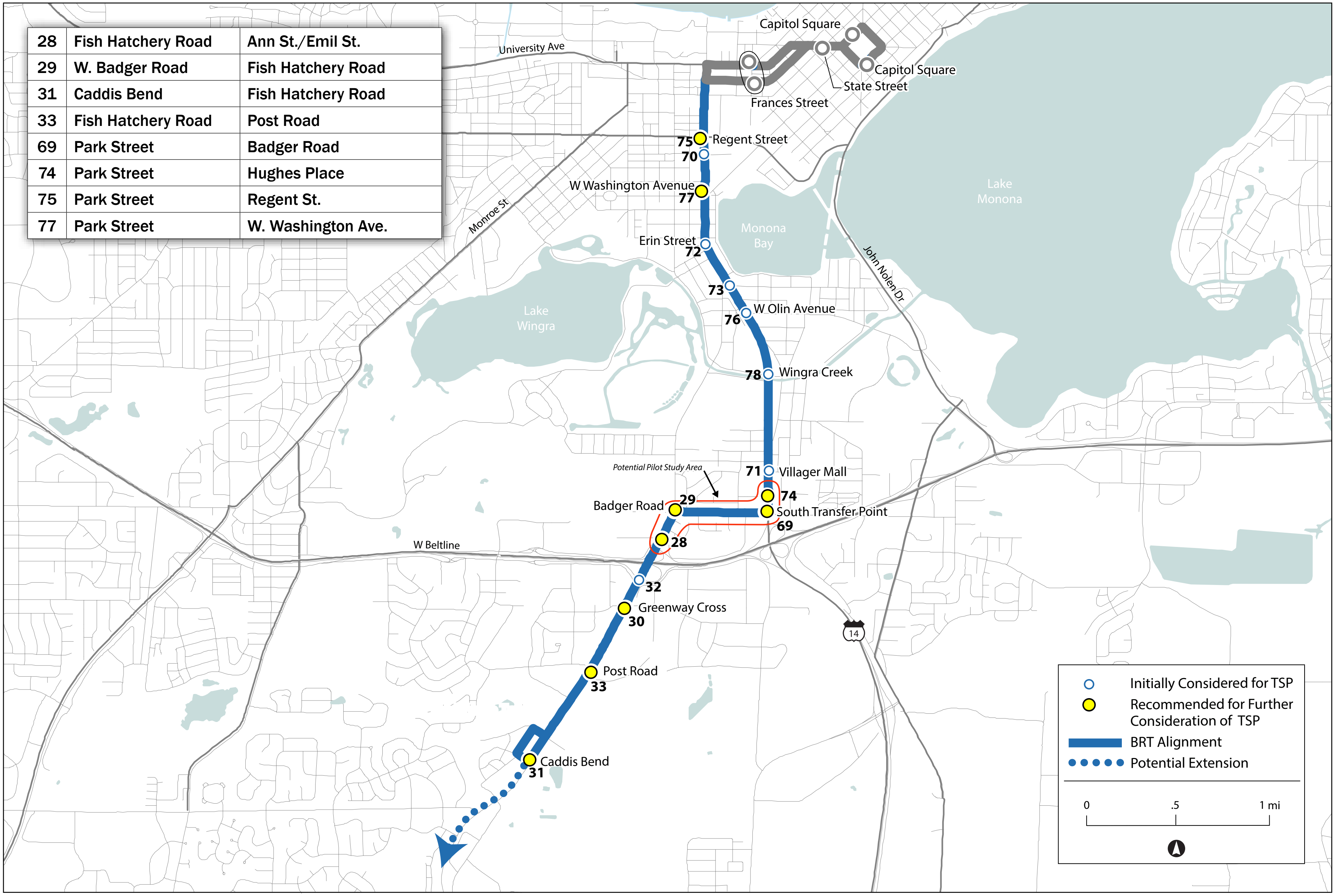
Preliminary recommended locations for Transit Signal Priority (TSP) will be used as inputs into the project's capital cost estimate and travel time estimates. In total, the alignments pass through 99 signalized intersections. 58 are preliminarily recommended for TSP, 41 are not recommended and 4 intersections are labeled "Exempt," because they are railroad crossings.

Corridor	Intersection ID	Intersection		TSP?
Central	1	Pinckney	Mifflin	Yes
	2	Mifflin St.	Wisconsin Ave.	Yes
	3	Mifflin St.	Carroll St./State St. (RT)	Yes
	4	State St.	W. Dayton St.	Yes
	5	State Street	Johnson St.	Yes
	6	State Street	Gorham St. (LT)	Yes
	7	Gorham St.	N. Broom St.	No
	8	University Ave.	N. Frances St.	No
	9	University Ave.	N. Lake St.	No
	10	University Ave.	Campus Mall	No
	11	University Ave.	Park St. (LT)	No
	12	University Ave.	N. Brooks St.	No
	13	University Ave.	N. MIls St.	No
	14	University Ave.	N. Charter St.	No
	15	University Ave.	N. Orchard St.	No
	16	University Ave.	N. Randall Ave.	No
	17	University Ave.	RR Xing/Ped Xing	No
	18	University Ave.	Campus Drive	No
	19	Campus Drive	Randall Ave.	No
	20	Johnson St.	Orchard St	No
	21	Johnson St.	Charter St.	No
	22	Johnson St.	Mills St.	No
	23	Johnson St.	Brooks St.	No
	24	Johnson St.	Park St.	No
	25	Johnson St.	E Campus Mall	No
	26	Johnson St.	Lake St.	No
	27	Johnson St.	Frances St.	No
	28	Johnson St.	Bassett St.	No
	29	Johnson St.	Broom St.	No
	30	Carroll	W. Washington Ave.	Yes
	31	Carroll	Main St.	Yes
	32	Main Street	Martin Luther King Blvd., Jr.	Yes
	33	Main Street	Pinckney Street/King Street (LT)	Yes
	34	Picnkney St.	Washington Ave. (RT)	No
	35	Washington Ave.	Webster St.	Yes
	36	Washington Ave.	Blair St.	No
	37	Washington Ave.	Paterson St.	Yes
	38	Washington Ave.	Ingersoll St.	Yes
	39	Washington Ave.	Baldwin St.	Yes

Corridor	Intersection ID	Intersection		TSP?
South	40	Park Street	W. Dayton St.	No
	41	Park Street	Regent St.	Yes
	42	Park Street	Braxton Place	Yes
	43	Park Street	W. Washington Ave.	No
	44	Park Street	Erin St.	Yes
	45	Park Street	Fish Hatchery Road	No
	46	Park Street	W. Olin Ave.	Yes
	47	Park Street	W. Wingra Dr. / Plaenert	No
	48	Park Street	Railroad Crossing	Exempt
	49	Park Street	Buick St.	Yes
	50	Park Street	Hughes Place	Yes
	51	Park Street	Badger Road (RT)	No
	52	W. Badger Road	Fish Hatchery Road (LT)	Yes
	53	Fish Hatchery Road	Ann St./Emil St.	Yes
	54	Fish Hatchery Road	Beltine WB Ramps	No
	55	Fish Hatchery Road	Beltline EB Ramps	No
	56	Fish Hatchery Road	Greenway Cross	No
	57	Fish Hatchery Road	Post Road	Yes
	58	Caddis Bend	Fish Hatchery Road (LT)	Yes
North	59	Busway Connection	Johnson Street	Yes
	60	Sherman Ave.	Commercial Ave.	Yes
	61	Sherman Ave.	Railroad Crossing	Exempt
	62	Sherman Ave.	Aberg Ave.	Yes
	63	Sherman Ave.	Schlimgen Ave.	Yes
East	64	Washington Ave.	RR Crossing #1	Exempt
	65	Washington Ave.	RR Crossing #2	Exempt
	66	Washington Ave.	First Street	No
	67	Washington Ave.	Fourth Street	No
	68	Washington Ave.	North St./Milwaukee St.	No
	69	Washington Ave.	Johnson St.	No
	70	Washington Ave.	N. Marquette	Yes
	71	Washington Ave.	Aberg Ave. SB Ramps	Yes
	72	Washington Ave.	Aberg Ave. NB Ramps	Yes
	73	Washington Ave.	Wright St. (LT)	Yes
	74	Wright St.	Anderson St. (RT)	Yes
	75	Anderson St.	Stoughton Road (RT)	Yes
	76	Stoughton Road	Washington Ave. (LT)	No
	77	Washington Ave.	Mendota St.	Yes
	78	Washington Ave.	Lien Road	Yes
	79	Washington Ave.	Thierer Road/Portage Road	Yes
	80	Washington Ave.	Eagan Road (RT)	Yes

Corridor	Intersection ID	Intersection		TSP?
West	81	University Ave.	Farley Ave.	No
	82	University Ave.	Ridge Street	Yes
	83	University Ave.	Shorewood Blvd.	No
	84	University Ave.	Midvale Blvd.	No
	85	University Ave.	Segoe Road (LT)	Yes
	86	Segoe Road	Frey Road	Yes
	87	Whitney Way	Regent St.	Yes
	88	Whitney Way	Mineral Point Road (RT)	Yes
	89	Mineral Point Road	Rosa Rd.	Yes
	90	Mineral Point Road	Island Dr.	Yes
	91	Mineral Point Road	Yellowstone Dr.(future signal)	Yes
	92	Mineral Point Road	Grand Canyon Dr.	Yes
	93	Mineral Point Road	Gammon Road	Yes
	94	Westfield Road	Mineral Point Road (LT)	Yes
	95	Mineral Point Road	Randolph Drive	Yes
	96	Gammon Road	High Point Road	Yes
Odana Road Alignment	97	Whitney Way	Science	Yes
	98	Whitney Way	Tokay Blvd. (RT)	Yes
	99	Tokay Blvd.	Odana Road (RT)	Yes
	100	Odana Road	Research Park Blvd.	Yes
	101	Odana Road	Potomac Lane	Yes
	102	Odana Road	Grand Canyon Drive	Yes
	103	Odana Road	Gammon Road	Yes

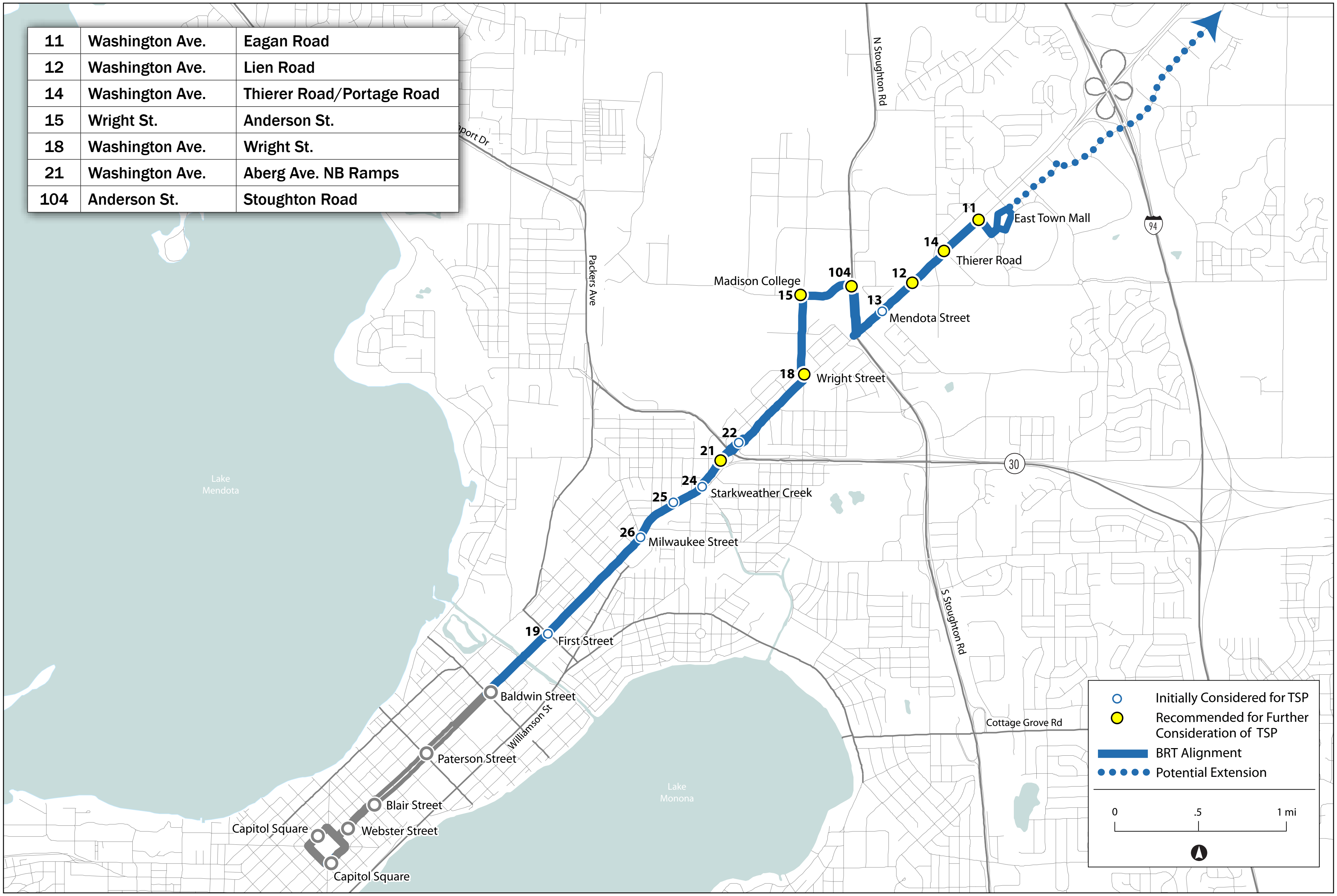
South Corridor: TSP Recommendations



28	Fish Hatchery Road	Ann St./Emil St.
29	W. Badger Road	Fish Hatchery Road
31	Caddis Bend	Fish Hatchery Road
33	Fish Hatchery Road	Post Road
69	Park Street	Badger Road
74	Park Street	Hughes Place
75	Park Street	Regent St.
77	Park Street	W. Washington Ave.

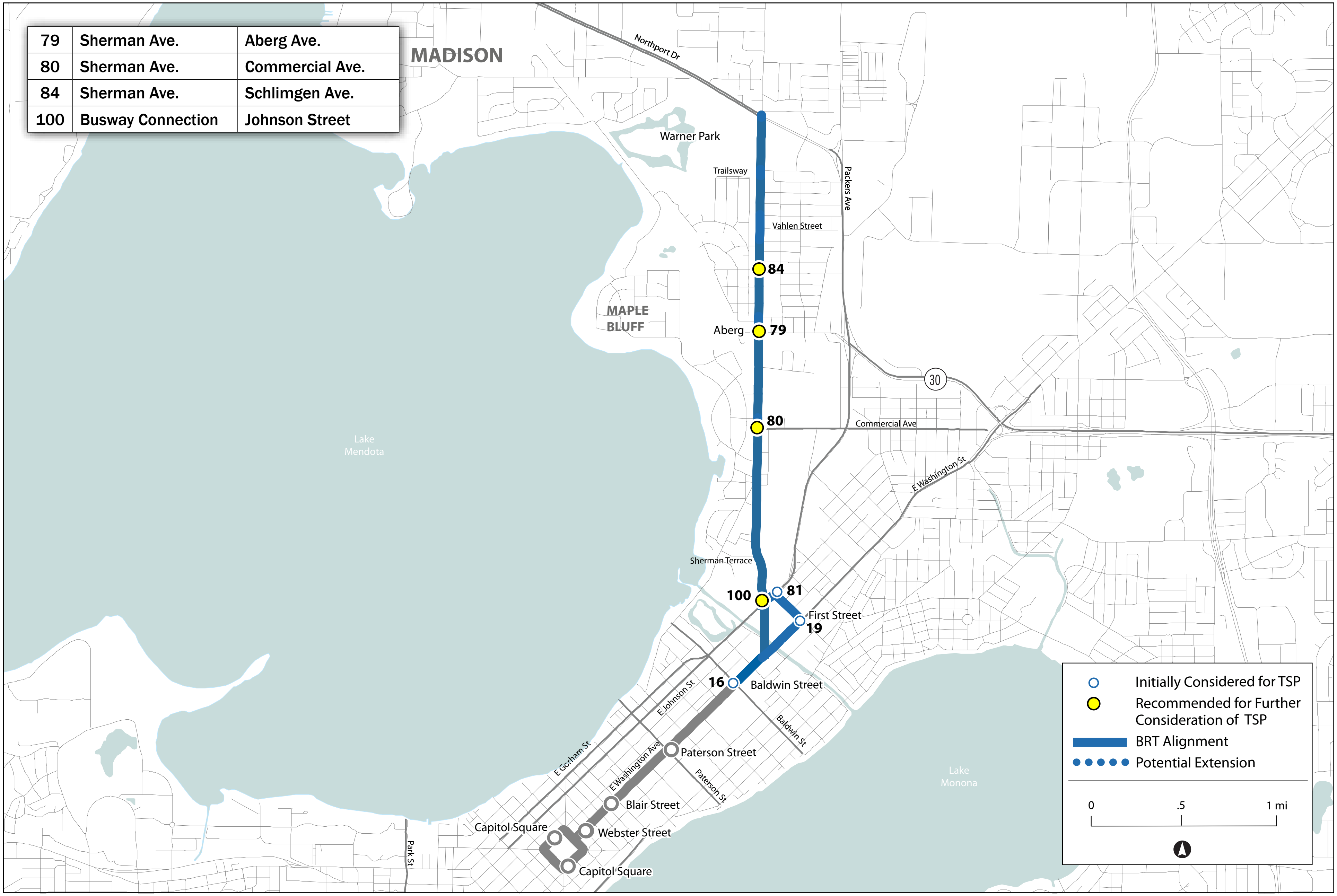
- ○ Initially Considered for TSP
- ● Recommended for Further Consideration of TSP
- ▬ BRT Alignment
- ● ● ● ● ● Potential Extension

East Corridor: TSP Recommendations



11	Washington Ave.	Eagan Road
12	Washington Ave.	Lien Road
14	Washington Ave.	Thierer Road/Portage Road
15	Wright St.	Anderson St.
18	Washington Ave.	Wright St.
21	Washington Ave.	Aberg Ave. NB Ramps
104	Anderson St.	Stoughton Road

North Corridor: TSP Recommendations

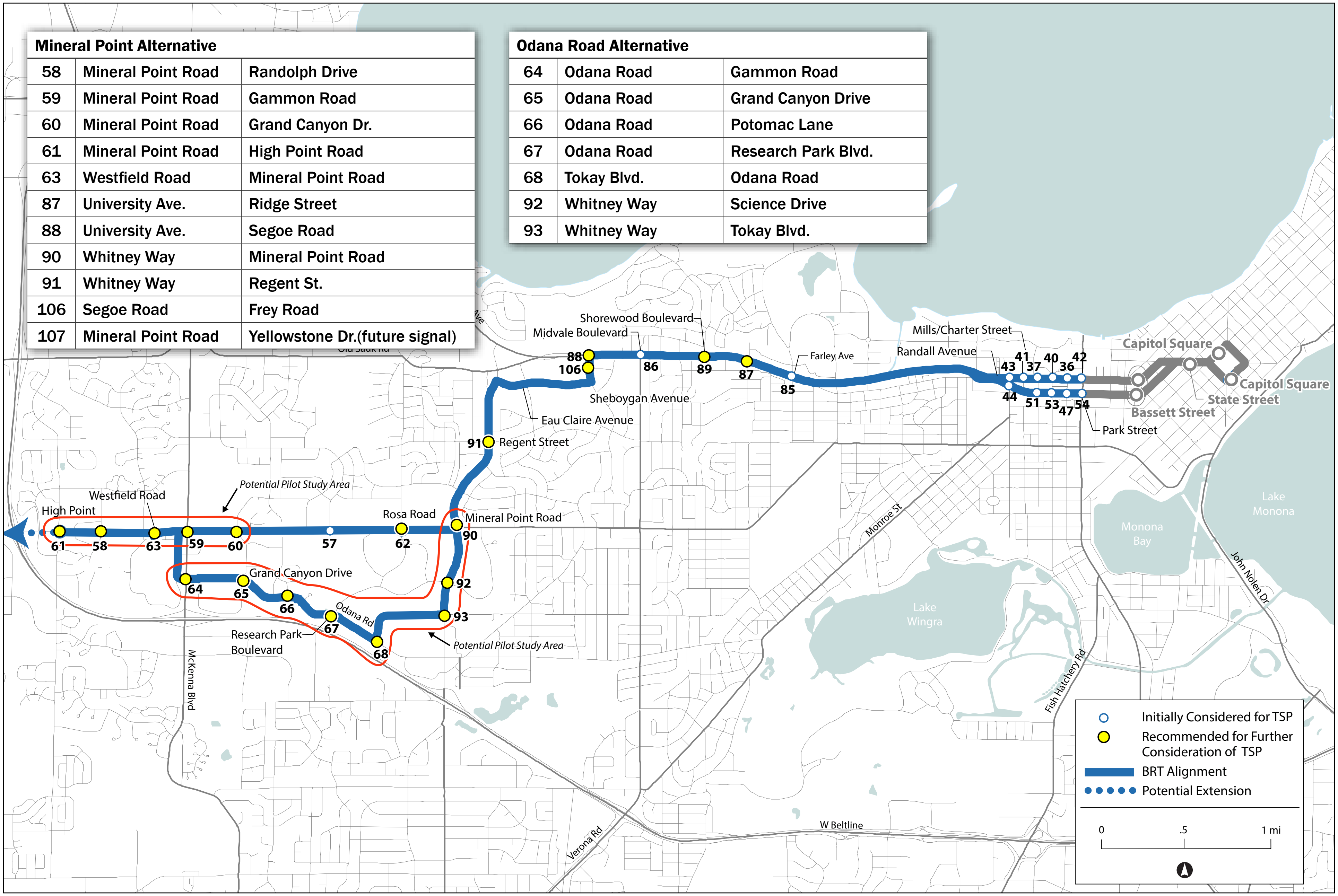


79	Sherman Ave.	Aberg Ave.
80	Sherman Ave.	Commercial Ave.
84	Sherman Ave.	Schlimgen Ave.
100	Busway Connection	Johnson Street

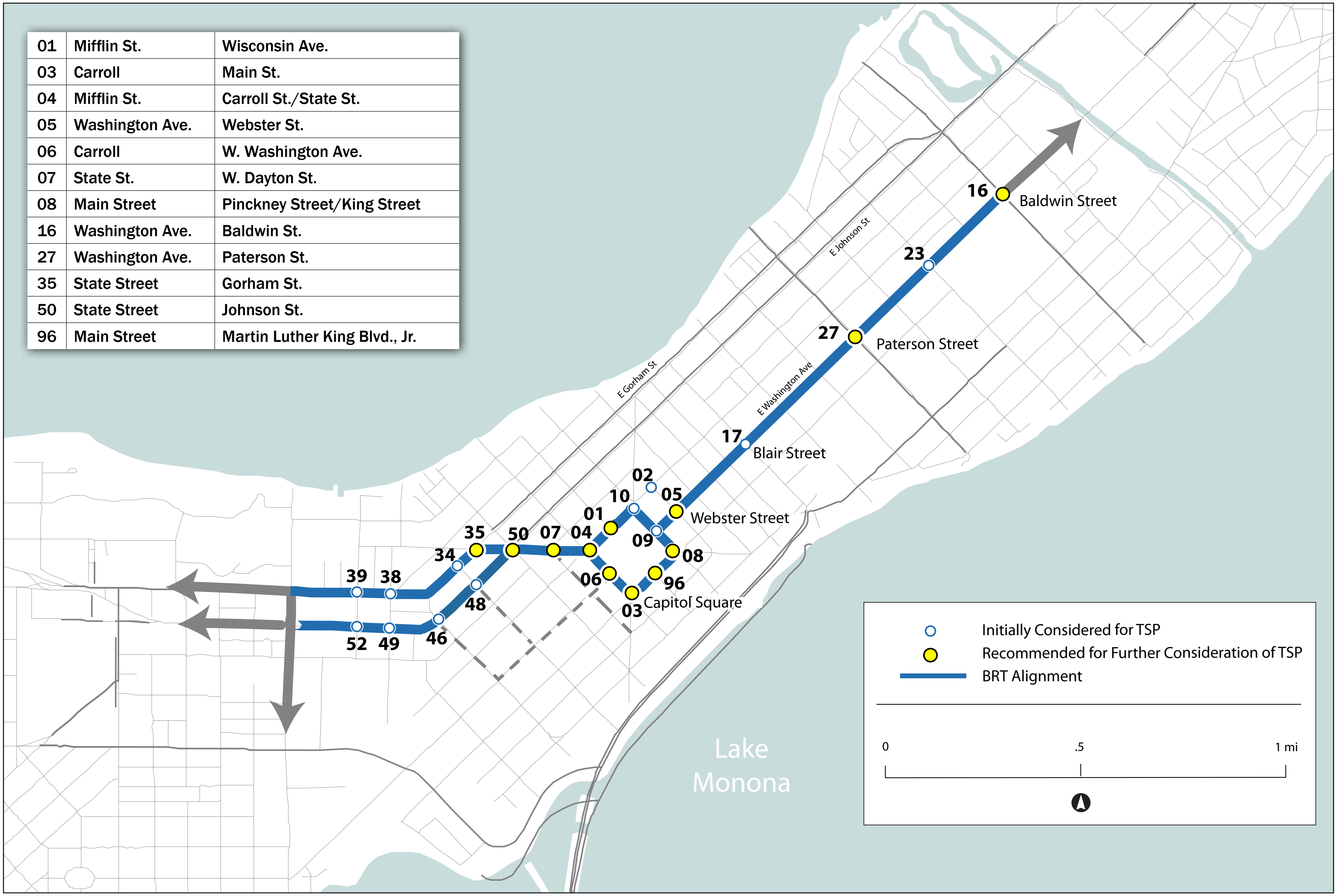
West Corridor: TSP Recommendations

Mineral Point Alternative		
58	Mineral Point Road	Randolph Drive
59	Mineral Point Road	Gammon Road
60	Mineral Point Road	Grand Canyon Dr.
61	Mineral Point Road	High Point Road
63	Westfield Road	Mineral Point Road
87	University Ave.	Ridge Street
88	University Ave.	Segoe Road
90	Whitney Way	Mineral Point Road
91	Whitney Way	Regent St.
106	Segoe Road	Frey Road
107	Mineral Point Road	Yellowstone Dr.(future signal)

Odana Road Alternative		
64	Odana Road	Gammon Road
65	Odana Road	Grand Canyon Drive
66	Odana Road	Potomac Lane
67	Odana Road	Research Park Blvd.
68	Tokay Blvd.	Odana Road
92	Whitney Way	Science Drive
93	Whitney Way	Tokay Blvd.



Central Corridor: TSP Recommendations



01	Mifflin St.	Wisconsin Ave.
03	Carroll	Main St.
04	Mifflin St.	Carroll St./State St.
05	Washington Ave.	Webster St.
06	Carroll	W. Washington Ave.
07	State St.	W. Dayton St.
08	Main Street	Pinckney Street/King Street
16	Washington Ave.	Baldwin St.
27	Washington Ave.	Paterson St.
35	State Street	Gorham St.
50	State Street	Johnson St.
96	Main Street	Martin Luther King Blvd., Jr.

TSP Slack Time Analysis - Timing Data

IntID	Phase	Movement	Phasing	Min Green	Yellow	Red Clear (All Red)	Walk	Ped Clear (FDW)	Ped Actuated?	Min Split Incl. peds?	TSP phase?	Default Min Split	Veh Min Split	Ped Min Split	Min Split	AM Pattern #	AM Cycle	AM Split (%)	AM Split (sec.)	AM Slack Time	AM TSP Time	AM TSP Time (% of ex. Split)	PM Pattern #	PM Cycle	PM Split (%)	PM Split (sec.)	PM Slack Time	PM TSP Time	PM TSP Time (% of ex. Split)
1	1											-	-	-	-	21	80		-	-	-	-	41	80		-	-	-	-
1	2	SWB	Mainline	10	3	1	1	7	No	Yes	Yes	20	15	13	20	21	80	45	36	16	11	32%	41	80	47	38	18	2	5%
1	3	Ped		5	2	0	1	9	No	Yes	No	-	8	13	13	21	80	32	26	13	-	-	41	80	19	15	2	-	-
1	4	SEB	X-Street	10	3	1	1	10	No	Yes	No	18	15	16	18	21	80	23	18	0	-	-	41	80	34	27	9	-	-
1	5											-	-	-	-	21	80		-	-	-	-	41	80		-	-	-	-
1	6											-	-	-	-	21	80		-	-	-	-	41	80		-	-	-	-
1	7	Ped	Ped	5	2	0	6	10	No	Yes	No	18	8	19	19	21	80	38	30	11	-	-	41	80	26	21	2	-	-
1	8											-	-	-	-	21	80		-	-	-	-	41	80		-	-	-	-
2	1											-	-	-	-	2	80		-	-	-	-	3	80		-	-	-	-
2	2	NEB	Mainline	5	3	1.5	10	11	No	Yes	No	20	10	26	26	2	80	65	52	26	-	-	3	80	65	52	26	-	-
2	3											-	-	-	-	2	80		-	-	-	-	3	80		-	-	-	-
2	4	SEBNWB	X-Street	5	3	3	10	9	No	Yes	No	18	12	26	26	2	80	35	28	2	-	-	3	80	35	28	2	-	-
2	5											-	-	-	-	2	80		-	-	-	-	3	80		-	-	-	-
2	6											-	-	-	-	2	80		-	-	-	-	3	80		-	-	-	-
2	7											-	-	-	-	2	80		-	-	-	-	3	80		-	-	-	-
2	8											-	-	-	-	2	80		-	-	-	-	3	80		-	-	-	-
3	1	SEB	Mainline	5	3	0.5	7	7	No	Yes	Yes	20	9	18	20	21	80	46	37	17	6	17%	41	80	46	37	17	6	17%
3	2	NB	X-Street	5	3	1	3	7	No	Yes	No	18	10	15	18	21	80	23	18	0	-	-	41	80	23	18	0	-	-
3	3											-	-	-	-	21	80		-	-	-	-	41	80		-	-	-	-
3	4	NWB	X-Street	5	3	0	5	10	No	Yes	No	18	9	19	19	21	80	31	25	6	-	-	41	80	31	25	6	-	-
3	5	Ped	Ped	0	1	0	0	0	No	Yes	No	18	2	-	18	21	80	2	2	0	-	-	41	80	2	2	0	-	-
3	6	Ped	Mainline	5	3	0.5	2	3	No	Yes	No	20	9	9	20	21	80	44	35	15	-	-	41	80	44	35	15	-	-
3	7											-	-	-	-	21	80		-	-	-	-	41	80		-	-	-	-
3	8	Ped	Ped	5	3	0	8	7	No	Yes	No	18	9	19	19	21	80	31	25	6	-	-	41	80	31	25	6	-	-
4	1	WB	Mainline						No	Yes	No	20	-	-	20	2	80	36	29	9	-	-	3	80	34	27	7	-	-
4	2	BusState	Mainline						No	Yes	No	20	-	-	20	2	80	24	19	0	-	-	3	80	26	21	1	-	-
4	3	StatePed										-	-	-	-	2	80	9	7	7	-	-	3	80	9	7	7	-	-
4	4	WB	X-Street						No	Yes	No	18	-	-	18	2	80	31	25	7	-	-	3	80	31	25	7	-	-
4	5											-	-	-	-	2	80		-	-	-	-	3	80		-	-	-	-
4	6											-	-	-	-	2	80	36	29	29	-	-	3	80	34	27	27	-	-
4	7											-	-	-	-	2	80		-	-	-	-	3	80		-	-	-	-
4	8											-	-	-	-	2	80	31	25	25	-	-	3	80	31	25	25	-	-
5	1											-	-	-	-	2	80		-	-	-	-	3	80		-	-	-	-
5	2	NEBSWB	Mainline	5	3	2	8	9	No	Yes	Yes	20	11	23	23	2	80	28	22	0	22	98%	3	80	44	35	12	9	26%
5	3	NWB	X-Street	5	3	0.5	0	7	No	Yes	No	18	9	-	18	2	80	50	40	22	-	-	3	80	34	27	9	-	-
5	4	Ped	Ped	5	1	0.5	7	9	No	Yes	No	18	7	18	18	2	80	22	18	0	-	-	3	80	22	18	0	-	-
5	5											-	-	-	-	2	80		-	-	-	-	3	80		-	-	-	-
5	6											-	-	-	-	2	80		-	-	-	-	3	80		-	-	-	-
5	7											-	-	-	-	2	80		-	-	-	-	3	80		-	-	-	-
5	8											-	-	-	-	2	80		-	-	-	-	3	80		-	-	-	-
6	1	SEB	Mainline	9	3	1.5	7	10	No	Yes	Yes	20	14	22	22	21	80	31	25	3	16	66%	41	80	31	25	3	16	66%
6	2	NEBSWB	X-Street	10	3.5	1.5	1	7	No	Yes	No	18	16	14	18	21	80	43	34	16	-	-	41	80	43	34	16	-	-
6	3											-	-	-	-	21	80		-	-	-	-	41	80		-	-	-	-
6	4	Ped	Ped	5	2	0	3	10	No	Yes	No	18	8	16	18	21	80	26	21	3	-	-	41	80	26	21	3	-	-
6	5											-	-	-	-	21	80		-	-	-	-	41	80		-	-	-	-
6	6											-	-	-	-	21	80		-	-	-	-	41	80		-	-	-	-
6	7											-	-	-	-	21	80		-	-	-	-	41	80		-	-	-	-
6	8	Ped	Ped	5	3	1	7	9	No	Yes	No	18	10	21	21	21	80	26	21	0	-	-	41	80	26	21	0	-	-

TSP Slack Time Analysis - Timing Data

IntID	Phase	Movement	Phasing	Min Green	Yellow	Red Clear (All Red)	Walk	Ped Clear (FDW)	Ped Actuated?	Min Split Incl. peds?	TSP phase?	Default Min Split	Veh Min Split	Ped Min Split	Min Split	AM Pattern #	AM Cycle	AM Split (%)	AM Split (sec.)	AM Slack Time	AM TSP Time	AM TSP Time (% of ex. Split)	PM Pattern #	PM Cycle	PM Split (%)	PM Split (sec.)	PM Slack Time	PM TSP Time	PM TSP Time (% of ex. Split)
7	1	Ped	Ped	1	1	0	0	7	No	Yes	No	18	3	-	18	2	80	3	2	0	-	-	3	80	3	2	0	-	-
7	2	SB	X-Street	17	3	1.5	10	7	No	Yes	No	18	22	22	22	2	80	60	48	26	-	-	3	80	60	48	26	-	-
7	3	Ped	Ped	1	1	0	0	12	No	Yes	No	18	3	-	18	2	80	3	2	0	-	-	3	80	3	2	0	-	-
7	4	EBWB	Mainline	5	3	1.5	10	12	No	Yes	Yes	20	10	27	27	2	80	34	27	0	26	96%	3	80	34	27	0	26	96%
7	5											-	-	-	-	2	80		-	-	-	-	3	80		-	-	-	-
7	6											-	-	-	-	2	80		-	-	-	-	3	80		-	-	-	-
7	7											-	-	-	-	2	80		-	-	-	-	3	80		-	-	-	-
7	8											-	-	-	-	2	80		-	-	-	-	3	80		-	-	-	-
8	1											-	-	-	-	2	80		-	-	-	-	3	80		-	-	-	-
8	2	NEB	Mainline	10	3	0.5	0	7	No	Yes	Yes	20	14	-	20	2	80	45	36	16	8	23%	3	80	45	36	16	8	23%
8	3	Ped	Ped	5	0	2	1	9	No	Yes	No	18	8	13	18	2	80	33	26	8	-	-	3	80	33	26	8	-	-
8	4	WB	X-Street	5	3	1	1	13	No	Yes	No	18	10	19	19	2	80	22	18	0	-	-	3	80	22	18	0	-	-
8	5											-	-	-	-	2	80		-	-	-	-	3	80		-	-	-	-
8	6											-	-	-	-	2	80	45	36	36	-	-	3	80	45	36	36	-	-
8	7	Ped	Ped	5	0	0	6	10	No	Yes	No	18	6	17	18	2	80	39	31	13	-	-	3	80	39	31	13	-	-
8	8											-	-	-	-	2	80	16	13	13	-	-	3	80	16	13	13	-	-
9	1	NWB	Mainline	9	3	1.5	7	10	No	Yes	Yes	20	14	22	22	21	80	37	30	8	13	45%	41	80	43	34	12	9	25%
9	2	NEBSWB	X-Street	10	3.5	1	1	7	No	Yes	Yes	18	15	13	18	21	80	33	26	8	13	48%	41	80	27	22	4	17	81%
9	3											-	-	-	-	21	80		-	-	-	-	41	80		-	-	-	-
9	4	Ped	Ped	5	2	0	3	9	No	Yes	No	18	8	15	18	21	80	30	24	6	-	-	41	80	30	24	6	-	-
9	5											-	-	-	-	21	80		-	-	-	-	41	80		-	-	-	-
9	6											-	-	-	-	21	80		-	-	-	-	41	80		-	-	-	-
9	7											-	-	-	-	21	80		-	-	-	-	41	80		-	-	-	-
9	8	Ped	Ped	5	2	0	7	9	No	Yes	No	18	8	19	19	21	80	30	24	5	-	-	41	80	30	24	5	-	-
10	1	NWB	Mainline	5	3	5	7	7	No	Yes	Yes	20	14	23	23	21	80	46	37	14	0	1%	41	80	46	37	14	0	1%
10	2	SB	X-Street	5	4	2	3	7	No	Yes	No	18	12	17	18	21	80	23	18	0	-	-	41	80	23	18	0	-	-
10	3											-	-	-	-	21	80		-	-	-	-	41	80		-	-	-	-
10	4	SEB	X-Street	5	3	0	0	7	No	Yes	No	18	9	-	18	21	80	18	14	0	-	-	41	80	18	14	0	-	-
10	5											-	-	-	-	21	80		-	-	-	-	41	80		-	-	-	-
10	6	Ped	Mainline	5	3	1	7	7	No	Yes	No	20	10	19	20	21	80	67	54	34	-	-	41	80	67	54	34	-	-
10	7											-	-	-	-	21	80		-	-	-	-	41	80		-	-	-	-
10	8	Ped	Ped	5	3	0	6	10	No	Yes	No	18	9	20	20	21	80	31	25	5	-	-	41	80	31	25	5	-	-
11	1	WBLT	Prot	7	3.5	2	0	0	No	Yes	No	12	13	-	13	3	90	16	14	1	-	-	2	100	16	16	3	-	-
11	2	EB	Mainline	35	4	1.5	7	16	No	Yes	Yes	20	41	29	41	3	90	38	34	0	7	20%	2	100	41	41	0	10	24%
11	3	NB	X-Street	10	3.5	2.5	0	0	No	Yes	Yes	18	17	-	18	3	90	25	23	5	2	10%	2	100	23	23	5	5	22%
11	4	SB	X-Street	8	3.5	2.5	7	10	Yes	No	No	18	15	-	18	3	90	21	19	1	-	-	2	100	20	20	2	-	-
11	5	EBLT	Prot	7	3.5	2	0	0	No	Yes	No	12	13	-	13	3	90	16	14	1	-	-	2	100	16	16	3	-	-
11	6	WB	Mainline	35	4	1.5	13	10	No	Yes	No	20	41	29	41	3	90	38	34	0	-	-	2	100	43	43	2	-	-
11	7											-	-	-	-	3	90		-	-	-	-	2	100		-	-	-	-
11	8	Ped	Ped	5	3.5	2.5	20	15	Yes	No	No	18	12	-	18	3	90	46	41	23	-	-	2	100	42	42	24	-	-
12	1	WBLT	P/P	4	3.5	1.5	0	0	No	No	No	11	10	-	11	3	90	12	11	0	-	-	2	100	9	9	0	-	-
12	2	EB	Mainline	16	4	1	7	9	Yes	No	Yes	20	22	-	22	3	90	61	55	33	5	10%	2	100	65	65	43	7	11%
12	3											-	-	-	-	3	90		-	-	-	-	2	100		-	-	-	-
12	4	NB	X-Street	12	3.5	2.5	15	11	Yes	No	No	18	19	-	19	3	90	27	24	5	-	-	2	100	26	26	7	-	-
12	5	EBLT	P/P	4	3.5	1.5	0	0	No	No	No	11	10	-	11	3	90	12	11	0	-	-	2	100	9	9	0	-	-
12	6	WB	Mainline	14	4	1	7	7	Yes	No	Yes	20	20	-	20	3	90	61	55	35	5	10%	2	100	65	65	45	7	11%
12	7											-	-	-	-	3	90		-	-	-	-	2	100		-	-	-	-
12	8											-	-	-	-	3	90		-	-	-	-	2	100		-	-	-	-

IntID	Phase	Movement	Phasing	Min Green	Yellow	Red Clear (All Red)	Walk	Ped Clear (FDW)	Ped Actuated?	Min Split Incl. peds?	TSP phase?	Default Min Split	Veh Min Split	Ped Min Split	Min Split	AM Pattern #	AM Cycle	AM Split (%)	AM Split (sec.)	AM Slack Time	AM TSP Time	AM TSP Time (% of ex. Split)	PM Pattern #	PM Cycle	PM Split (%)	PM Split (sec.)	PM Slack Time	PM TSP Time	PM TSP Time (% of ex. Split)
13	1	WBLT	P/P	4	3.5	1.5	0	0	No	No		11	10	-	11	3	90	12	11	0	-	-	2	100	10	10	0	-	-
13	2	EB	Mainline	14	4	1	10	11	Yes	No	Yes	20	20	-	20	3	90	64	58	38	4	6%	2	100	67	67	47	5	7%
13	3											-	-	-	-	3	90		-	-	-	-	2	100		-	-	-	-
13	4	NBSB	X-Street	10	3.5	2.5	17	12	Yes	No		18	17	-	18	3	90	24	22	4	-	-	2	100	23	23	5	-	-
13	5	EBLT	P/P	4	3.5	1.5	0	0	No	No		11	10	-	11	3	90	10	9	0	-	-	2	100	12	12	1	-	-
13	6	WB	Mainline	14	4	1	10	11	Yes	No	Yes	20	20	-	20	3	90	66	59	39	4	6%	2	100	65	65	45	6	9%
13	7											-	-	-	-	3	90		-	-	-	-	2	100		-	-	-	-
13	8											-	-	-	-	3	90		-	-	-	-	2	100		-	-	-	-
14	1	WBLT	P/P	4	3.5	2	0	0	No	No	No	11	10	-	11	3	90	13	12	1	-	-	2	100	10	10	0	-	-
14	2	EB	Mainline	21	4	1.5	7	14	Yes	No	Yes	20	27	-	27	3	90	63	57	30	4	8%	2	100	66	66	39	6	9%
14	3											-	-	-	-	3	90		-	-	-	-	2	100		-	-	-	-
14	4	NBSB	X-Street	10	3.5	3	18	12	Yes	No	No	18	17	-	18	3	90	24	22	4	-	-	2	100	24	24	6	-	-
14	5	EBLT	P/P	4	3.5	2	0	0	No	No	No	11	10	-	11	3	90	13	12	1	-	-	2	100	15	15	4	-	-
14	6	WB	Mainline	18	4	1.5	7	13	Yes	No	Yes	20	24	-	24	3	90	63	57	33	4	8%	2	100	61	61	37	10	16%
14	7											-	-	-	-	3	90		-	-	-	-	2	100		-	-	-	-
14	8											-	-	-	-	3	90		-	-	-	-	2	100		-	-	-	-
15	1	NBLT	P/P	5	4	1	0	0	No	No	No	11	11	-	11	Free	Free		18	7	-	-	Free	Free		18	7	-	-
15	2	SB	Mainline	10	3.5	1.5	10	13	Yes	No	No	20	16	-	20	Free	Free		30	10	-	-	Free	Free		30	10	-	-
15	3											-	-	-	-	Free	Free		-	-	-	-	Free	Free		-	-	-	-
15	4	EBWB	X-Street	10	3.5	1.5	10	13	Yes	No	Yes	18	16	-	18	Free	Free		35	17	10	29%	Free	Free		35	17	10	29%
15	5											-	-	-	-	Free	Free		-	-	-	-	Free	Free		-	-	-	-
15	6	NB	Mainline	10	3.5	1.5	10	13	Yes	No	Yes	20	16	-	20	Free	Free		30	10	17	57%	Free	Free		30	10	17	57%
15	7											-	-	-	-	Free	Free		-	-	-	-	Free	Free		-	-	-	-
15	8											-	-	-	-	Free	Free		-	-	-	-	Free	Free		-	-	-	-
16	1	WBLT	P/P	4	3.5	1	0	0	No	No	No	11	9	-	11	5	100	15	15	4	-	-	6	100	12	12	1	-	-
16	2	EB	Mainline	17	3.5	1	7	10	Yes	No	Yes	20	22	-	22	5	100	56	56	34	8	14%	6	100	57	57	35	8	14%
16	3	Ped	Ped	1	3	0	0	0	No	Yes	No	18	5	-	18	5	100	7	7	0	-	-	6	100	6	6	0	-	-
16	4	NBSB	X-Street	10	3.5	3	17	11	Yes	No	No	18	17	-	18	5	100	22	22	4	-	-	6	100	25	25	7	-	-
16	5											-	-	-	-	5	100		-	-	-	-	6	100		-	-	-	-
16	6	WB-OLA									Yes	-	-	-	-	5	100	71	71	71	4	6%	6	100	69	69	69	7	10%
16	7											-	-	-	-	5	100		-	-	-	-	6	100		-	-	-	-
16	8	Ped	Ped	10	3.5	3	17	11	Yes	No	No	18	17	-	18	5	100	29	29	11	-	-	6	100	31	31	13	-	-
17	1	EB	Mainline	15	3.5	2	6	10	No	Yes	Yes	20	21	22	22	5	100	23	23	1	24	104%	6	100	36	36	14	9	25%
17	2	WBLT	Prot	10	3.5	1	7	9	No	Yes	No	12	15	21	21	5	100	42	42	21	-	-	6	100	22	22	1	-	-
17	3	NB	X-Street	4	3	1	1	7	Yes	No	No	18	9	-	18	5	100	14	14	0	-	-	6	100	16	16	0	-	-
17	4	SB	X-Street	8	3.5	2.5	7	8	Yes	No	No	18	15	-	18	5	100	21	21	3	-	-	6	100	26	26	8	-	-
17	5											-	-	-	-	5	100		-	-	-	-	6	100		-	-	-	-
17	6	WB-OLB									Yes	-	-	-	-	5	100	65	65	65	3	5%	6	100	58	58	58	8	14%
17	7											-	-	-	-	5	100		-	-	-	-	6	100		-	-	-	-
17	8											-	-	-	-	5	100		-	-	-	-	6	100		-	-	-	-
18	1	WBLT	P/P	6	3.5	1.5	0	0	No	Yes	No	11	12	-	12	5	100	21	21	9	-	-	6	100	21	21	9	-	-
18	2	EB	Mainline	16	3.5	1.5	10	18	No	Yes	No	20	22	34	34	5	100	48	48	14	-	-	6	100	47	47	13	-	-
18	3											-	-	-	-	5	100		-	-	-	-	6	100		-	-	-	-
18	4	NBSB	X-Street	9	3.5	3.5	16	12	No	Yes	Yes	18	17	36	36	5	100	31	31	0	23	74%	6	100	32	32	0	22	69%
18	5	EBLT	Prot	6	3.5	1.5	0	7	No	Yes	Yes	12	12	-	12	5	100	19	19	7	16	84%	6	100	19	19	7	15	79%
18	6	WB	Mainline	16	3.5	1.5	10	18	No	Yes	No	20	22	34	34	5	100	50	50	16	-	-	6	100	49	49	15	-	-
18	7											-	-	-	-	5	100		-	-	-	-	6	100		-	-	-	-
18	8											-	-	-	-	5	100		-	-	-	-	6	100		-	-	-	-

TSP Slack Time Analysis - Timing Data

IntID	Phase	Movement	Phasing	Min Green	Yellow	Red Clear (All Red)	Walk	Ped Clear (FDW)	Ped Actuated?	Min Split Incl. peds?	TSP phase?	Default Min Split	Veh Min Split	Ped Min Split	Min Split	AM Pattern #	AM Cycle	AM Split (%)	AM Split (sec.)	AM Slack Time	AM TSP Time	AM TSP Time (% of ex. Split)	PM Pattern #	PM Cycle	PM Split (%)	PM Split (sec.)	PM Slack Time	PM TSP Time	PM TSP Time (% of ex. Split)
19	1	EBLT	Prot	5	3	2.5	0	7	No	Yes	No	12	11	-	12	5	100	15	15	3	-	-	6	100	36	36	24	-	-
19	2	WB	Mainline	20	3.5	1.5	7	9	No	Yes	Yes	20	26	22	26	5	100	51	51	25	8	16%	6	100	30	30	4	29	97%
19	3	NBLT	P/P	5	3	2.5	0	7	No	Yes	No	11	11	-	11	5	100	14	14	3	-	-	6	100	11	11	0	-	-
19	4	SB	X-Street	6	3.5	3	9	9	Yes	No	No	18	13	-	18	5	100	20	20	2	-	-	6	100	23	23	5	-	-
19	5	WBLT	P/P	4	3	2	0	7	No	Yes	No	11	10	-	11	5	100	18	18	7	-	-	6	100	10	10	0	-	-
19	6	EB	Mainline	20	3.5	1.5	7	15	No	Yes	Yes	20	26	28	28	5	100	48	48	20	12	25%	6	100	56	56	28	5	9%
19	7											-	-	-	-	5	100		-	-	-	-	6	100		-	-	-	-
19	8	NB	Ped	10	3.5	3	18	12	Yes	No	No	18	17	-	18	5	100	34	34	16	-	-	6	100	34	34	16	-	-
20	1											-	-	-	-	5	100		-	-	-	-	6	100		-	-	-	-
20	2	EBWB	Mainline	17	3.5	1.5	7	10	Yes	No	Yes	20	23	-	23	5	100	67	67	44	15	22%	6	100	67	67	44	15	22%
20	3	Ped	Ped	5	3	0	1	6	No	Yes	No	18	9	11	18	5	100		-	-	-	-	6	100		-	-	-	-
20	4	NBSB	X-Street	10	3	3.5	21	10	Yes	No	No	18	17	-	18	5	100	33	33	15	-	-	6	100	33	33	15	-	-
20	5											-	-	-	-	5	100		-	-	-	-	6	100		-	-	-	-
20	6											-	-	-	-	5	100		-	-	-	-	6	100		-	-	-	-
20	7											-	-	-	-	5	100		-	-	-	-	6	100		-	-	-	-
20	8											-	-	-	-	5	100		-	-	-	-	6	100		-	-	-	-
21	1	Ped	Ped	10	3.5	3.5	7	6	Yes	No	No	18	18	-	18	3	90	23	21	3	-	-	2	90	23	21	3	-	-
21	2	WB	Mainline	20	3.5	2.5	0	0	No	No	Yes	20	27	-	27	3	90	40	36	9	6	16%	2	90	40	36	9	6	16%
21	3	NBLT	Prot	8	3.5	1.5	0	0	No	No	No	12	14	-	14	3	90	19	17	3	-	-	2	90	19	17	3	-	-
21	4	Ped	Ped	8	3.5	0.5	6	6	Yes	No	No	18	13	-	18	3	90	18	16	0	-	-	2	90	18	16	0	-	-
21	5	WBLT	Prot	6	3.5	3.5	0	0	No	No	No	12	14	-	14	3	90	23	21	7	-	-	2	90	23	21	7	-	-
21	6	EB	Mainline	20	3.5	2.5	10	10	Yes	No	Yes	20	27	-	27	3	90	40	36	9	10	27%	2	90	40	36	9	10	27%
21	7											-	-	-	-	3	90		-	-	-	-	2	90		-	-	-	-
21	8	NB	X-Street	8	3.5	0.5	6	6	Yes	No	No	18	13	-	18	3	90	37	33	15	-	-	2	90	37	33	15	-	-
22	1	EBLT	Prot	6	3.5	2	0	0	No	No	No	12	12	-	12	3	90	18	16	4	-	-	2	90	17	15	3	-	-
22	2	WB	Mainline	25	3.5	3.5	10	15	Yes	No	Yes	20	33	-	33	3	90	63	57	24	4	7%	2	90	64	58	25	3	6%
22	3											-	-	-	-	3	90		-	-	-	-	2	90		-	-	-	-
22	4	SB	X-Street	8	3.5	1.5	0	0	No	No	No	18	14	-	18	3	90	19	17	0	-	-	2	90	19	17	0	-	-
22	5											-	-	-	-	3	90		-	-	-	-	2	90		-	-	-	-
22	6	EB	Mainline	20	3.5	2	0	0	No	No	Yes	20	26	-	26	3	90	81	73	47	0	0%	2	90	81	73	47	0	0%
22	7											-	-	-	-	3	90		-	-	-	-	2	90		-	-	-	-
22	8	SBLT	Prot	8	3.5	1.5	0	0	No	No	No	12	14	-	14	3	90	19	17	3	-	-	2	90	19	17	3	-	-
23	1	WBLT	P/P	4	3.5	0.5	0	7	No	No	No	11	9	-	11	5	100	14	14	3	-	-	6	100	15	15	4	-	-
23	2	EB	Mainline	17	3.5	1	7	10	No	Yes	Yes	20	22	22	22	5	100	66	66	44	5	8%	6	100	62	62	40	9	15%
23	3											-	-	-	-	5	100		-	-	-	-	6	100		-	-	-	-
23	4	NBSB	X-Street	8	3.5	3	16	10	Yes	No	No	18	15	-	18	5	100	20	20	2	-	-	6	100	23	23	5	-	-
23	5											-	-	-	-	5	100		-	-	-	-	6	100		-	-	-	-
23	6	WB-OLA									Yes	-	-	-	-	5	100	80	80	80	2	3%	6	100	77	77	77	5	6%
23	7											-	-	-	-	5	100		-	-	-	-	6	100		-	-	-	-
23	8											-	-	-	-	5	100		-	-	-	-	6	100		-	-	-	-
24	1											-	-	-	-	5	100		-	-	-	-	6	100		-	-	-	-
24	2	EB	Mainline	18	3.5	1	7	10	No	Yes	Yes	20	23	22	23	5	100	70	70	47	2	3%	6	100	58	58	35	7	12%
24	3	NB	X-Street	4	3	2	5	7	Yes	No	No	18	10	-	18	5	100	10	10	0	-	-	6	100	17	17	0	-	-
24	4	SB	X-Street	5	3	3	1	12	Yes	No	No	18	12	-	18	5	100	20	20	2	-	-	6	100	25	25	7	-	-
24	5											-	-	-	-	5	100		-	-	-	-	6	100		-	-	-	-
24	6	WB	Mainline	18	3.5	1	7	10	No	Yes	Yes	20	23	22	23	5	100	70	70	47	2	3%	6	100	58	58	35	7	12%
24	7											-	-	-	-	5	100		-	-	-	-	6	100		-	-	-	-
24	8	Ped	Ped	10	3	3	16	11	Yes	No	No	18	17	-	18	5	100	30	30	12	-	-	6	100	31	31	13	-	-

IntID	Phase	Movement	Phasing	Min Green	Yellow	Red Clear (All Red)	Walk	Ped Clear (FDW)	Ped Actuated?	Min Split Incl. peds?	TSP phase?	Default Min Split	Veh Min Split	Ped Min Split	Min Split	AM Pattern #	AM Cycle	AM Split (%)	AM Split (sec.)	AM Slack Time	AM TSP Time	AM TSP Time (% of ex. Split)	PM Pattern #	PM Cycle	PM Split (%)	PM Split (sec.)	PM Slack Time	PM TSP Time	PM TSP Time (% of ex. Split)
25	1											-	-	-	-	5	100		-	-	-	-	6	100		-	-	-	-
25	2	EB	Mainline	18	3.5	0.5	10	10	No	Yes	Yes	20	23	25	25	5	100	71	71	46	0	0%	6	100	71	71	46	0	0%
25	3	WBLT	Prot	6	3.5	0.5	0	0	No	No	No	12	11	-	12	5	100	11	11	0	-	-	6	100	11	11	0	-	-
25	4	NB	X-Street	6	3	2.5	18	10	Yes	No	No	18	12	-	18	5	100	18	18	0	-	-	6	100	18	18	0	-	-
25	5											-	-	-	-	5	100		-	-	-	-	6	100		-	-	-	-
25	6	WB-OLA									Yes	-	-	-	-	5	100	82	82	82	0	0%	6	100	82	82	82	0	0%
25	7											-	-	-	-	5	100		-	-	-	-	6	100		-	-	-	-
25	8	SB Ped	Ped	5	3	1	6	26	Yes	No	No	18	10	-	18	5	100	18	18	0	-	-	6	100	18	18	0	-	-
26	1	WBLT	P/P	4	3.5	1.5	0	7	No	No	No	11	10	-	11	5	100	10	10	0	-	-	6	100	10	10	0	-	-
26	2	EB	Mainline	15	3.5	2	10	7	No	Yes	Yes	20	21	23	23	5	100	45	45	22	9	20%	6	100	51	51	28	3	6%
26	3	SB	X-Street	10	3.5	2.5	5	7	Yes	No	No	18	17	-	18	5	100	20	20	2	-	-	6	100	19	19	1	-	-
26	4	NB	X-Street	10	3.5	2.5	1	12	Yes	No	No	18	17	-	18	5	100	25	25	7	-	-	6	100	20	20	2	-	-
26	5	EBLT	P/P	5	3.5	1.5	0	0	No	No	No	11	11	-	11	5	100	11	11	0	-	-	6	100	11	11	0	-	-
26	6	WB	Mainline	15	3.5	2	10	7	No	Yes	Yes	20	21	23	23	5	100	44	44	21	9	20%	6	100	50	50	27	3	6%
26	7											-	-	-	-	5	100		-	-	-	-	6	100		-	-	-	-
26	8	Ped	Ped	15	3.5	2.5	16	11	Yes	No	No	18	22	-	22	5	100	31	31	9	-	-	6	100	31	31	9	-	-
27	1											-	-	-	-	5	100		-	-	-	-	6	100		-	-	-	-
27	2	EBWB	Mainline	17	3.5	1.5	7	10	No	Yes	Yes	20	23	23	23	5	100	67	67	44	15	22%	6	100	67	67	44	15	22%
27	3											-	-	-	-	5	100		-	-	-	-	6	100		-	-	-	-
27	4	NBSB	X-Street	8	3.5	3	16	10	Yes	No	No	18	15	-	18	5	100	33	33	15	-	-	6	100	33	33	15	-	-
27	5											-	-	-	-	5	100		-	-	-	-	6	100		-	-	-	-
27	6											-	-	-	-	5	100		-	-	-	-	6	100		-	-	-	-
27	7											-	-	-	-	5	100		-	-	-	-	6	100		-	-	-	-
27	8											-	-	-	-	5	100		-	-	-	-	6	100		-	-	-	-
28	1	SBLT	P/P	4	3.5	1.5	0	0	No	No	No	11	10	-	11	3	90	13	12	1	-	-	4	100	12	12	1	-	-
28	2	NB	Mainline	20	3.5	2.5	6	16	Yes	No	Yes	20	27	-	27	3	90	57	51	24	10	19%	4	100	57	57	30	14	25%
28	3											-	-	-	-	3	90		-	-	-	-	4	100		-	-	-	-
28	4	EB	X-Street	10	3.5	2.5	7	20	Yes	No	No	18	17	-	18	3	90	30	27	9	-	-	4	100	31	31	13	-	-
28	5	NBLT	P/P	5	3.5	1.5	0	0	No	No	No	11	11	-	11	3	90	22	20	9	-	-	4	100	13	13	2	-	-
28	6	SB	Mainline	20	3.5	2.5	6	16	Yes	No	Yes	20	27	-	27	3	90	48	43	16	18	41%	4	100	56	56	29	15	27%
28	7											-	-	-	-	3	90		-	-	-	-	4	100		-	-	-	-
28	8	WB	X-Street	10	3.5	2.5	7	20	Yes	No	No	18	17	-	18	3	90	30	27	9	-	-	4	100	31	31	13	-	-
29	1	NBLT	P/P	5	3.5	1	0	0	No	No	No	11	10	-	11	4	90	12	11	0	-	-	3	100	13	13	2	-	-
29	2	SB	Mainline	18	3.5	1.5	7	10	Yes	No	No	20	24	-	24	4	90	58	52	28	-	-	3	100	56	56	32	-	-
29	3											-	-	-	-	4	90		-	-	-	-	3	100		-	-	-	-
29	4	EB	X-Street	12	3.5	2.5	15	10	Yes	No	No	18	19	-	19	4	90	30	27	8	-	-	3	100	31	31	12	-	-
29	5											-	-	-	-	4	90		-	-	-	-	3	100		-	-	-	-
29	6	NB	Mainline	18	3.5	1.5	7	10	Yes	No	Yes	20	24	-	24	4	90	70	63	39	8	13%	3	100	69	69	45	12	17%
29	7											-	-	-	-	4	90		-	-	-	-	3	100		-	-	-	-
29	8	WB	X-Street	12	3.5	2.5	15	10	Yes	No	Yes	18	19	-	19	4	90	30	27	8	28	104%	3	100	31	31	12	34	110%
30	1	SBLT	Prot	6	3.5	1.5	0	0	No	No	No	12	12	-	12		90	11	10	0	-	-		130	16	21	9	-	-
30	2	NB	Mainline	18	3.5	2	10	12	Yes	No	Yes	20	24	-	24		90	33	30	6	19	64%		130	43	56	32	26	46%
30	3											-	-	-	-		90		-	-	-	-		130		-	-	-	-
30	4	EB	X-Street	0	3.5	2.5	10	11	Yes	No	No	18	7	-	18		90	55	50	32	-	-		130	41	53	35	-	-
30	5	NBLT	P/P	6	3.5	1.5	6	9	No	No	No	11	12	21	21		90	11	10	0	-	-		130	7	9	0	-	-
30	6	SB	Mainline	18	3.5	2	18	10	Yes	No	Yes	20	24	-	24		90	33	30	6	19	64%		130	52	68	44	17	25%
30	7	EBLT	P/P	6	4	1	6	7	No	No	No	11	12	19	19		90	14	13	0	-	-		130	14	18	0	-	-
30	8	WB	X-Street	10	3.5	2.5	10	10	Yes	No	No	18	17	-	18		90	41	37	19	-	-		130	27	35	17	-	-

TSP Slack Time Analysis - Timing Data

IntID	Phase	Movement	Phasing	Min Green	Yellow	Red Clear (All Red)	Walk	Ped Clear (FDW)	Ped Actuated?	Min Split Incl. peds?	TSP phase?	Default Min Split	Veh Min Split	Ped Min Split	Min Split	AM Pattern #	AM Cycle	AM Split (%)	AM Split (sec.)	AM Slack Time	AM TSP Time	AM TSP Time (% of ex. Split)	PM Pattern #	PM Cycle	PM Split (%)	PM Split (sec.)	PM Slack Time	PM TSP Time	PM TSP Time (% of ex. Split)
31	1	NBLT	P/P	4	4	1	0	0	No	No	No	11	10	-	11	3	90	11	10	0	-	-	5	100	11	11	0	-	-
31	2	SB	Mainline	18	4	1	7	17	No	Yes	No	20	24	30	30	3	90	57	51	21	-	-	5	100	53	53	23	-	-
31	4	WB	X-Street	8	3	2.5	14	8	Yes	No	No	18	14	-	18	3	90	16	14	0	-	-	5	100	16	16	0	-	-
31	8	EB	X-Street	8	3	2.5	0	8	No	No	Yes	18	14	-	18	3	90	16	14	0	21	148%	5	100	20	20	2	23	115%
31	5	SBLT	P/P	4	4	1	0	0	No	No	No	11	10	-	11	3	90	11	10	0	-	-	5	100	10	10	0	-	-
31	6	NB	Mainline	18	4	1	7	17	No	Yes	No	20	24	30	30	3	90	57	51	21	-	-	5	100	54	54	24	-	-
31	3											-	-	-	-	3	90		-	-	-	-	5	100		-	-	-	-
31	7											-	-	-	-	3	90		-	-	-	-	5	100		-	-	-	-
32	1	SBLT	Prot	6	3.5	1.5	0	0	No	No	No	12	12	-	12	3	90	35	32	20	-	-	4	100	37	37	25	-	-
32	2	NB	Mainline	20	3.5	2.5	6	10	No	Yes	Yes	20	27	23	27	3	90	43	39	12	21	55%	4	100	35	35	8	35	100%
32	3											-	-	-	-	3	90		-	-	-	-	4	100		-	-	-	-
32	4	WB	X-Street	9	3.5	2.5	0	16	No	No	No	18	16	-	18	3	90	22	20	2	-	-	4	100	28	28	10	-	-
32	5											-	-	-	-	3	90		-	-	-	-	4	100		-	-	-	-
32	6	SB	Mainline	20	3.5	2.5	6	16	No	Yes	Yes	20	27	29	29	3	90	78	70	41	2	3%	4	100	72	72	43	10	14%
32	7											-	-	-	-	3	90		-	-	-	-	4	100		-	-	-	-
32	8											-	-	-	-	3	90		-	-	-	-	4	100		-	-	-	-
33	1	NBLT	P/P	6	4	1	0	0	No	No	No	11	12	-	12	4	90	15	14	2	-	-	3	100	15	15	3	-	-
33	2	SB	Mainline	15	4	1.5	6	14	Yes	No	Yes	20	21	-	21	4	90	45	41	20	20	48%	3	100	55	55	34	15	27%
33	3											-	-	-	-	4	90		-	-	-	-	3	100		-	-	-	-
33	4	WB	X-Street	8	3.5	2	6	24	Yes	No	No	18	14	-	18	4	90	40	36	18	-	-	3	100	30	30	12	-	-
33	5											-	-	-	-	4	90		-	-	-	-	3	100		-	-	-	-
33	6	NB	Mainline	15	4	1.5	6	21	Yes	No	Yes	20	21	-	21	4	90	60	54	33	18	33%	3	100	70	70	49	12	17%
33	7											-	-	-	-	4	90		-	-	-	-	3	100		-	-	-	-
33	8	EB	X-Street	8	3.5	2	6	24	Yes	No	No	18	14	-	18	4	90	40	36	18	-	-	3	100	55	55	37	-	-
34	1											-	-	-	-	4	100		-	-	-	-	5	110		-	-	-	-
34	2	SWB	Mainline	16	3.5	1	7	11	No	Yes	Yes	20	21	23	23	4	100	77	77	54	0	0%	5	110	79	87	64	0	0%
34	3											-	-	-	-	4	100		-	-	-	-	5	110		-	-	-	-
34	4	NWB	X-Street	10	3	1.5	7	11	No	Yes	No	18	15	23	23	4	100	23	23	0	-	-	5	110	21	23	0	-	-
34	5											-	-	-	-	4	100		-	-	-	-	5	110		-	-	-	-
34	6											-	-	-	-	4	100		-	-	-	-	5	110		-	-	-	-
34	7											-	-	-	-	4	100		-	-	-	-	5	110		-	-	-	-
34	8											-	-	-	-	4	100		-	-	-	-	5	110		-	-	-	-
35	1											-	-	-	-	4	100		-	-	-	-	5	110		-	-	-	-
35	2	SWB	Mainline	16	3.5	1.5	7	9	No	Yes	No	20	22	22	22	4	100	73	73	51	-	-	5	110	75	83	61	-	-
35	3											-	-	-	-	4	100		-	-	-	-	5	110		-	-	-	-
35	4	EBWB	X-Street	10	3	2.5	10	11	No	Yes	Yes	18	16	27	27	4	100	27	27	0	51	189%	5	110	25	28	1	61	220%
35	5											-	-	-	-	4	100		-	-	-	-	5	110		-	-	-	-
35	6											-	-	-	-	4	100		-	-	-	-	5	110		-	-	-	-
35	7											-	-	-	-	4	100		-	-	-	-	5	110		-	-	-	-
35	8											-	-	-	-	4	100		-	-	-	-	5	110		-	-	-	-
36	1											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
36	2	WB	Mainline	16	3.5	1	7	9	No	Yes	Yes	20	21	21	21	3	100	73	73	52	0	0%	4	110	70	77	56	5	6%
36	3											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
36	4	NB	X-Street	10	3	2	9	13	No	Yes	No	18	16	28	28	3	100	27	27	0	-	-	4	110	30	33	5	-	-
36	5											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
36	6											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
36	7											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
36	8											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-

TSP Slack Time Analysis - Timing Data

IntID	Phase	Movement	Phasing	Min Green	Yellow	Red Clear (All Red)	Walk	Ped Clear (FDW)	Ped Actuated?	Min Split Incl. peds?	TSP phase?	Default Min Split	Veh Min Split	Ped Min Split	Min Split	AM Pattern #	AM Cycle	AM Split (%)	AM Split (sec.)	AM Slack Time	AM TSP Time	AM TSP Time (% of ex. Split)	PM Pattern #	PM Cycle	PM Split (%)	PM Split (sec.)	PM Slack Time	PM TSP Time	PM TSP Time (% of ex. Split)
37	1											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
37	2	WB	Mainline	21	3.5	2.5	7	14	No	Yes	Yes	20	28	28	28	3	100	70	70	42	1	1%	4	110	62	68	40	13	19%
37	3											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
37	4	NBSB	X-Street	12	3.5	2.5	9	13	No	Yes	No	18	19	29	29	3	100	30	30	1	-	-	4	110	38	42	13	-	-
37	5											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
37	6											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
37	7											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
37	8											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
38	1											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
38	2	WB	Mainline	17	3.5	2	7	10	No	Yes	Yes	20	23	23	23	3	100	67	67	44	1	1%	4	110	67	74	51	4	6%
38	3											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
38	4	NB	X-Street	12	3	2.5	13	13	No	Yes	No	18	18	32	32	3	100	33	33	1	-	-	4	110	33	36	4	-	-
38	5											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
38	6											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
38	7											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
38	8	SB	X-Street	6	3	2.5	8	18	No	Yes	No	18	12	32	32	3	100	33	33	1	-	-	4	110	33	36	4	-	-
39	1											-	-	-	-				-	-	-	-				-	-	-	-
39	2											-	-	-	-	-	-		-	-	-	-	-	-		-	-	-	-
39	3											-	-	-	-	-	-		-	-	-	-	-	-		-	-	-	-
39	4											-	-	-	-	-	-		-	-	-	-	-	-		-	-	-	-
39	5											-	-	-	-	-	-		-	-	-	-	-	-		-	-	-	-
39	6											-	-	-	-	-	-		-	-	-	-	-	-		-	-	-	-
39	7											-	-	-	-	-	-		-	-	-	-	-	-		-	-	-	-
39	8											-	-	-	-	-	-		-	-	-	-	-	-		-	-	-	-
40	1											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
40	2	WB	Mainline	17	3.5	1	7	9	No	Yes	Yes	20	22	21	22	3	100	68	68	46	4	6%	4	110	73	80	58	2	2%
40	3											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
40	4	NB	X-Street	10	3	2	8	14	No	Yes	No	18	16	28	28	3	100	32	32	4	-	-	4	110	27	30	2	-	-
40	5											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
40	6											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
40	7											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
40	8											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
41	1											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
41	2	WB	Mainline	16	3.5	1	7	7	No	Yes	Yes	20	21	19	21	3	100	74	74	53	0	0%	4	110	75	83	62	1	1%
41	3											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
41	4	Ped	Ped	10	3	0	7	16	No	Yes	No	18	14	27	27	3	100	26	26	0	-	-	4	110	25	28	1	-	-
41	5											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
41	6											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
41	7											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
41	8											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
42	1	EB	Mainline	17	3.5	2	4	13	No	Yes	No	20	23	23	23	3	100	28	28	5	-	-	4	110	27	30	7	-	-
42	2	WBLT	P/P	7	3.5	2	0	7	No	No	No	11	13	-	13	3	100	20	20	7	-	-	4	110	33	36	23	-	-
42	3											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
42	4	NB	X-Street	15	3.5	2	15	12	Yes	Yes	No	18	21	33	33	3	100	52	52	19	-	-	4	110	40	44	11	-	-
42	5											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
42	6	WB	Mainline	26	3.5	2	15	11	No	Yes	Yes	20	32	32	32	3	100	48	48	16	19	40%	4	110	60	66	34	11	17%
42	7	SB	X-Street	16	3	2	6	10	Yes	Yes	No	18	22	22	22	3	100	21	21	0	-	-	4	110	20	22	0	-	-
42	8	NBLT	P/P	4	3.5	2	0	7	No	No	No	11	10	-	11	3	100	31	31	20	-	-	4	110	20	22	11	-	-

TSP Slack Time Analysis - Timing Data

IntID	Phase	Movement	Phasing	Min Green	Yellow	Red Clear (All Red)	Walk	Ped Clear (FDW)	Ped Actuated?	Min Split Incl. peds?	TSP phase?	Default Min Split	Veh Min Split	Ped Min Split	Min Split	AM Pattern #	AM Cycle	AM Split (%)	AM Split (sec.)	AM Slack Time	AM TSP Time	AM TSP Time (% of ex. Split)	PM Pattern #	PM Cycle	PM Split (%)	PM Split (sec.)	PM Slack Time	PM TSP Time	PM TSP Time (% of ex. Split)
43	1											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
43	2	EB	Mainline	16	3.5	1	7	9	No	Yes	No	20	21	21	21	3	100	37	37	16	-	-	4	110	41	45	24	-	-
43	3	WBLT	P/P	10	3.5	1	0	0	No	No	No	11	15	-	15	3	100	37	37	22	-	-	4	110	33	36	21	-	-
43	4	NB	X-Street	10	3	2	8	13	No	Yes	No	18	16	27	27	3	100	26	26	0	-	-	4	110	26	29	2	-	-
43	5											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
43	6	WB-OLA									Yes	-	-	-	-	3	100	74	74	74	0	0%	4	110	74	81	81	2	2%
43	7											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
43	8											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
44	1											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
44	2	EB	Mainline	17	3.5	1.5	10	7	No	Yes	Yes	20	23	23	23	3	100	73	73	50	1	1%	4	110	75	83	60	2	2%
44	3											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
44	4	SB	X-Street	10	3	1.5	9	12	No	Yes	No	18	15	26	26	3	100	27	27	1	-	-	4	110	25	28	2	-	-
44	5											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
44	6											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
44	7											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
44	8											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
45	1											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
45	2	EB	Mainline	17	3.5	1.5	7	12	No	Yes	Yes	20	23	25	25	3	100	64	64	39	9	14%	4	110	61	67	42	16	24%
45	3											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
45	4	SB	X-Street	10	3	2.5	9	12	Yes	Yes	No	18	16	27	27	3	100	36	36	9	-	-	4	110	39	43	16	-	-
45	5											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
45	6											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
45	7	Ped	Ped	0	3	0	0	0	No	No	No	18	4	-	18	3	100	4	4	0	-	-	4	110	3	3	0	-	-
45	8	NBRT	X-Street	7	3	2.5	0	7	No	No	No	18	13	-	18	3	100	32	32	14	-	-	4	110	36	40	22	-	-
46	1											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
46	2	EB	Mainline	17	3.5	1	7	10	No	Yes	Yes	20	22	22	22	3	100	70	70	48	5	7%	4	110	73	80	58	5	6%
46	3											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
46	4	SB	X-Street	17	3	2	8	11	No	Yes	No	18	23	25	25	3	100	30	30	5	-	-	4	110	27	30	5	-	-
46	5											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
46	6											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
46	7											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
46	8											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
47	1											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
47	2	EB	Mainline	20	3.5	1	7	11	No	Yes	Yes	20	25	23	25	3	100	73	73	48	0	0%	4	110	73	80	55	3	3%
47	3											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
47	4	SB	X-Street	15	3	2	10	11	Yes	Yes	No	18	21	27	27	3	100	27	27	0	-	-	4	110	27	30	3	-	-
47	5											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
47	6											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
47	7											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
47	8											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
48	1											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
48	2	EB	Mainline	16	3.5	1.5	7	9	No	Yes	Yes	20	22	22	22	3	100	70	70	48	6	9%	4	110	65	72	50	15	20%
48	3											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
48	4	SB	X-Street	12	3	2	8	10	No	Yes	No	18	18	24	24	3	100	30	30	6	-	-	4	110	35	39	15	-	-
48	5											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
48	6											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
48	7											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
48	8											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-

IntID	Phase	Movement	Phasing	Min Green	Yellow	Red Clear (All Red)	Walk	Ped Clear (FDW)	Ped Actuated?	Min Split Incl. peds?	TSP phase?	Default Min Split	Veh Min Split	Ped Min Split	Min Split	AM Pattern #	AM Cycle	AM Split (%)	AM Split (sec.)	AM Slack Time	AM TSP Time	AM TSP Time (% of ex. Split)	PM Pattern #	PM Cycle	PM Split (%)	PM Split (sec.)	PM Slack Time	PM TSP Time	PM TSP Time (% of ex. Split)
49	1											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
49	2	EB	Mainline	18	3.5	1	7	11	No	Yes	Yes	20	23	23	23	3	100	72	72	49	1	1%	4	110	75	83	60	1	1%
49	3											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
49	4	SB	X-Street	12	3	2	10	11	Yes	Yes	No	18	18	27	27	3	100	28	28	1	-	-	4	110	25	28	1	-	-
49	5											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
49	6											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
49	7											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
49	8											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
50	1											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
50	2	NEB	Mainline	18	3.5	1	7	7	No	Yes	Yes	20	23	19	23	3	100	77	77	54	0	0%	4	110	79	87	64	0	0%
50	3											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
50	4	EBWB	X-Street	15	3.5	3	7	9	No	Yes	Yes	18	22	23	23	3	100	23	23	0	54	235%	4	110	21	23	0	64	277%
50	5											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
50	6											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
50	7											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
50	8											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
51	1											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
51	2	EB	Mainline	20	3.5	1	7	12	No	Yes	Yes	20	25	24	25	3	100	66	66	41	7	11%	4	110	67	74	49	9	13%
51	3											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
51	4	NBSB	X-Street	15	3	2	10	11	Yes	Yes	No	18	21	27	27	3	100	34	34	7	-	-	4	110	33	36	9	-	-
51	5											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
51	6											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
51	7											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
51	8											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
52	1											-	-	-	-				-	-	-	-				-	-	-	-
52	2											-	-	-	-	-	-		-	-	-	-	-	-		-	-	-	-
52	3											-	-	-	-	-	-		-	-	-	-	-	-		-	-	-	-
52	4											-	-	-	-	-	-		-	-	-	-	-	-		-	-	-	-
52	5											-	-	-	-	-	-		-	-	-	-	-	-		-	-	-	-
52	6											-	-	-	-	-	-		-	-	-	-	-	-		-	-	-	-
52	7											-	-	-	-	-	-		-	-	-	-	-	-		-	-	-	-
52	8											-	-	-	-	-	-		-	-	-	-	-	-		-	-	-	-
53	1											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
53	2	EB	Mainline	20	3.5	1	7	12	No	Yes	Yes	20	25	24	25	3	100	73	73	48	0	0%	4	110	70	77	52	6	8%
53	3											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
53	4	NBSB	X-Street	15	3	2	10	11	Yes	Yes	No	18	21	27	27	3	100	27	27	0	-	-	4	110	30	33	6	-	-
53	5											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
53	6											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
53	7											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
53	8											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
54	1											-	-	-	-	4	100		-	-	-	-	5	110		-	-	-	-
54	2	EB	Mainline	20	3.5	3	13	10	No	Yes	Yes	20	27	30	30	4	100	66	66	36	0	0%	5	110	64	70	40	4	6%
54	5	SBLT	Prot	5	3.5	1	0	0	No	Yes	No	12	10		12	4	100	10	10	0	-	-	5	110	15	17	5	-	-
54	3+4	NB,NBRT	X-Street	7	6.5	0.5	2	13	Yes	Yes	No	18	15	23	23	4	100	24	24	1	-	-	5	110	21	23	0	-	-
54	-											-	-	-	-	4	100		-	-	-	-	5	110		-	-	-	-
54	6	WB Bike	Mainline	5	3	1	0	16	No	Yes	No	20	10	-	20	4	100	66	66	46	-	-	5	110	64	70	50	-	-
54	7	Ped	Ped	5	3	0	1	3	No	Yes	No	18	9	8	18	4	100	16	16	0	-	-	5	110	20	22	4	-	-
54	8	SB	X-Street	5	3.5	1	1	12	Yes	Yes	No	18	10	18	18	4	100	18	18	0	-	-	5	110	16	18	0	-	-

IntID	Phase	Movement	Phasing	Min Green	Yellow	Red Clear (All Red)	Walk	Ped Clear (FDW)	Ped Actuated?	Min Split Incl. peds?	TSP phase?	Default Min Split	Veh Min Split	Ped Min Split	Min Split	AM Pattern #	AM Cycle	AM Split (%)	AM Split (sec.)	AM Slack Time	AM TSP Time	AM TSP Time (% of ex. Split)	PM Pattern #	PM Cycle	PM Split (%)	PM Split (sec.)	PM Slack Time	PM TSP Time	PM TSP Time (% of ex. Split)
55	1											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
55	2	EB	Mainline	20	3.5	1	0	7	No	Yes	Yes	20	25	-	25	3	100	78	78	53	0	0%	4	110	80	88	63	0	0%
55	3											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
55	4	NBSB	X-Street	15	3.5	0	9	9	Yes	Yes	No	18	19	22	22	3	100	22	22	0	-	-	4	110	20	22	0	-	-
55	5											-	-	-	-	3	100		-	-	-	-	4	110		-	-	-	-
55	6	WB	Mainline	20	3.5	1	0	7	No	Yes	Yes	20	25	-	25	3	100	71	71	46	0	0%	4	110	66	73	48	0	0%
55	7	NBSB	Ped	1	3.5	2	0	0	Yes	Yes	No	18	7	-	18	3	100	7	7	0	-	-	4	110	14	15	0	-	-
55	8	NBSB	X-Street	15	3	2	8	8	Yes	Yes	No	18	21	22	22	3	100	22	22	0	-	-	4	110	20	22	0	-	-
56	1											-	-	-	-				-	-	-	-				-	-	-	-
56	2											-	-	-	-	-	-		-	-	-	-	-	-		-	-	-	-
56	3											-	-	-	-	-	-		-	-	-	-	-	-		-	-	-	-
56	4											-	-	-	-	-	-		-	-	-	-	-	-		-	-	-	-
56	5											-	-	-	-	-	-		-	-	-	-	-	-		-	-	-	-
56	6											-	-	-	-	-	-		-	-	-	-	-	-		-	-	-	-
56	7											-	-	-	-	-	-		-	-	-	-	-	-		-	-	-	-
56	8											-	-	-	-	-	-		-	-	-	-	-	-		-	-	-	-
57	1	EBWB	Mainline	13	4	1	0	0	No	Yes	Yes	20	19	-	20	211	95	76	72	52	0	0%	311	100	78	78	58	0	0%
57	2											-	-	-	-	211	95		-	-	-	-	311	100		-	-	-	-
57	3	NBSB	X-Street	10	3	2.5	19	12	No	Yes	No	18	16	37	37	211	95	24	23	0	-	-	311	100	22	22	0	-	-
57	4											-	-	-	-	211	95		-	-	-	-	311	100		-	-	-	-
57	5											-	-	-	-	211	95		-	-	-	-	311	100		-	-	-	-
57	6											-	-	-	-	211	95		-	-	-	-	311	100		-	-	-	-
57	7											-	-	-	-	211	95		-	-	-	-	311	100		-	-	-	-
57	8											-	-	-	-	211	95		-	-	-	-	311	100		-	-	-	-
58	3	WBLT	P/P	6	4	1	0	0	No	Yes	No	11	12	-	12	211	95	16	15	3	-	-	311	100	12	12	0	-	-
58	1	EB	Mainline	25	4	1	0	0	No	Yes	Yes	20	31	-	31	211	95	60	57	26	3	6%	311	100	58	58	27	0	0%
58	4											-	-	-	-	211	95		-	-	-	-	311	100		-	-	-	-
58	2	NBSB	X-Street	10	3.5	2.5	18	11	No	Yes	No	18	17	36	36	211	95	24	23	0	-	-	311	100	30	30	0	-	-
58	5											-	-	-	-	211	95		-	-	-	-	311	100		-	-	-	-
58	6	WB-OLA									Yes	-	-	-	-	211	95	76	72	72	0	0%	311	100	70	70	70	0	0%
58	7											-	-	-	-	211	95		-	-	-	-	311	100		-	-	-	-
58	8											-	-	-	-	211	95		-	-	-	-	311	100		-	-	-	-
59	1	NBLT	P/P	6	3.5	1	0	0	No	No	No	11	11	-	11	Free	Free		30	19	-	-	Free	Free		30	19	-	-
59	2	SB	X-Street	15	3.5	2	17	11	Yes	No	No	18	21	-	21	Free	Free		45	24	-	-	Free	Free		45	24	-	-
59	3	WBLT	P/P	6	3.5	1	0	0	No	No	No	11	11	-	11	Free	Free		30	19	-	-	Free	Free		30	19	-	-
59	4	EB	Mainline	15	4	1.5	17	11	Yes	No	Yes	20	21	-	21	Free	Free		50	29	62	124%	Free	Free		50	29	62	124%
59	5	SBLT	P/P	6	3.5	1	0	0	No	No	No	11	11	-	11	Free	Free		30	19	-	-	Free	Free		30	19	-	-
59	6	NB	X-Street	15	3.5	2	17	11	Yes	No	No	18	21	-	21	Free	Free		45	24	-	-	Free	Free		45	24	-	-
59	7	EBLT	P/P	6	3.5	1	0	0	No	No	No	11	11	-	11	Free	Free		25	14	-	-	Free	Free		25	14	-	-
59	8	WB	Mainline	15	4	1.5	17	11	Yes	No	Yes	20	21	-	21	Free	Free		50	29	57	114%	Free	Free		50	29	57	114%
60	1	WBLT	P/P	5	4	0.5	0	0	No	No	No	11	10	-	11	211	95	13	12	1	-	-	311	100	18	18	7	-	-
60	2	EB	Mainline	20	4	0.5	16	10	Yes	No	Yes	20	25	-	25	211	95	62	59	34	7	12%	311	100	49	49	24	22	45%
60	3											-	-	-	-	211	95		-	-	-	-	311	100		-	-	-	-
60	4	NBSB	X-Street	9	3.5	2	15	12	Yes	No	No	18	15	-	18	211	95	25	24	6	-	-	311	100	33	33	15	-	-
60	5	EBLT	P/P	5	4	0.5	0	9	No	No	No	11	10	-	11	211	95	0	-	-	-	-	311	100	13	13	2	-	-
60	6	WB	Mainline	10	4	0.5	0	12	Yes	No	Yes	20	15	-	20	211	95	75	71	51	6	8%	311	100	54	54	34	17	31%
60	7											-	-	-	-	211	95		-	-	-	-	311	100		-	-	-	-
60	8											-	-	-	-	211	95		-	-	-	-	311	100		-	-	-	-

IntID	Phase	Movement	Phasing	Min Green	Yellow	Red Clear (All Red)	Walk	Ped Clear (FDW)	Ped Actuated?	Min Split Incl. peds?	TSP phase?	Default Min Split	Veh Min Split	Ped Min Split	Min Split	AM Pattern #	AM Cycle	AM Split (%)	AM Split (sec.)	AM Slack Time	AM TSP Time	AM TSP Time (% of ex. Split)	PM Pattern #	PM Cycle	PM Split (%)	PM Split (sec.)	PM Slack Time	PM TSP Time	PM TSP Time (% of ex. Split)
61	1	WBLT	P/P	5	4	0.5	0	0	No	No	No	11	10	-	11	211	95	12	11	0	-	-	311	100	12	12	1	-	-
61	2	EB	Mainline	10	4	0.5	8	16	Yes	No	Yes	20	15	-	20	211	95	53	50	30	15	29%	311	100	42	42	22	28	67%
61	3											-	-	-	-	211	95		-	-	-	-	311	100		-	-	-	-
61	4	NBSB	X-Street	13	3.5	2	15	12	Yes	No	No	18	19	-	19	211	95	35	33	14	-	-	311	100	46	46	27	-	-
61	5	EBLT	P/P	5	4	0.5	0	9	No	No	No	11	10	-	11	211	95	12	11	0	-	-	311	100	12	12	1	-	-
61	6	WB	Mainline	10	4	0.5	8	16	Yes	No	Yes	20	15	-	20	211	95	53	50	30	15	29%	311	100	42	42	22	28	67%
61	7											-	-	-	-	211	95		-	-	-	-	311	100		-	-	-	-
61	8											-	-	-	-	211	95		-	-	-	-	311	100		-	-	-	-
62	1	EBWB	Mainline	10	4	1	2	11	Yes	No	Yes	20	16	-	20	211	95	76	72	52	4	5%	311	100	75	75	55	6	8%
62	2											-	-	-	-	211	95		-	-	-	-	311	100		-	-	-	-
62	3	NBSB	X-Street	13	3	2.5	12	8	Yes	No	No	18	19	-	19	211	95	24	23	4	-	-	311	100	25	25	6	-	-
62	4											-	-	-	-	211	95		-	-	-	-	311	100		-	-	-	-
62	5											-	-	-	-	211	95		-	-	-	-	311	100		-	-	-	-
62	6											-	-	-	-	211	95		-	-	-	-	311	100		-	-	-	-
62	7											-	-	-	-	211	95		-	-	-	-	311	100		-	-	-	-
62	8											-	-	-	-	211	95		-	-	-	-	311	100		-	-	-	-
63	1	WBLT	P/P	5	4	1	0	8	No	No	No	11	11	-	11	211	95	0	-	-	-	-	311	100	17	17	6	-	-
63	2	EB	Mainline	15	4	1	0	8	Yes	No	Yes	20	21	-	21	211	95	74	70	49	7	10%	311	100	44	44	23	27	61%
63	3											-	-	-	-	211	95		-	-	-	-	311	100		-	-	-	-
63	4	NBSB	X-Street	10	3.5	2.5	15	11	Yes	No	Yes	18	17	-	18	211	95	26	25	7	49	200%	311	100	39	39	21	29	74%
63	5											-	-	-	-	211	95		-	-	-	-	311	100		-	-	-	-
63	6	WB-OLA									No	-	-	-	-	211	95	74	70	70	-	-	311	100	61	61	61	-	-
63	7											-	-	-	-	211	95		-	-	-	-	311	100		-	-	-	-
63	8											-	-	-	-	211	95		-	-	-	-	311	100		-	-	-	-
64	1	NBLT	Prot	5	3.5	2	0	0	No	No	No	12	11	-	12	211	95	21	20	8	-	-	311	100	22	22	10	-	-
64	2	SB	Mainline	12	3.5	1.5	11	8	Yes	No	No	20	18	-	20	211	95	58	55	35	-	-	311	100	26	26	6	-	-
64	3	WBLT	P/P	6	3.5	1	0	0	No	No	No	11	11	-	11	211	95	0	-	-	-	-	311	100	36	36	25	-	-
64	4	EB	X-Street	10	3.5	2.5	7	10	Yes	No	Yes	18	17	-	18	211	95	21	20	2	43	216%	311	100	16	16	0	41	256%
64	5	SBLT	Prot	5	3.5	2	0	0	No	No	No	12	11	-	12	211	95	21	20	8	-	-	311	100	12	12	0	-	-
64	6	NB	Mainline	12	3.5	1.5	11	8	Yes	No	No	20	18	-	20	211	95	58	55	35	-	-	311	100	36	36	16	-	-
64	7	EBLT	P/P	5	3.5	1	0	0	No	No	No	11	10	-	11	211	95	0	-	-	-	-	311	100	11	11	0	-	-
64	8	WB	X-Street	10	3.5	2.5	17	13	Yes	No	Yes	18	17	-	18	211	95	21	20	2	43	216%	311	100	41	41	23	16	39%
65	1											-	-	-	-	Free	Free		-	-	-	-	Free	Free		-	-	-	-
65	2	EBWB	Mainline	10	3.5	1	7	10	Yes	No	Yes	20	15	-	20	Free	Free		45	25	15	33%	Free	Free		45	25	15	33%
65	3											-	-	-	-	Free	Free		-	-	-	-	Free	Free		-	-	-	-
65	4	NBSB	X-Street	7	3.5	1	8	14	Yes	No	Yes	18	12	-	18	Free	Free		33	15	25	76%	Free	Free		33	15	25	76%
65	5											-	-	-	-	Free	Free		-	-	-	-	Free	Free		-	-	-	-
65	6											-	-	-	-	Free	Free		-	-	-	-	Free	Free		-	-	-	-
65	7											-	-	-	-	Free	Free		-	-	-	-	Free	Free		-	-	-	-
65	8											-	-	-	-	Free	Free		-	-	-	-	Free	Free		-	-	-	-
66	1											-	-	-	-	Free	Free		-	-	-	-	Free	Free		-	-	-	-
66	2	EBWB	Mainline	15	3.5	1	0	7	Yes	No	Yes	20	20	-	20	Free	Free		55	35	12	22%	Free	Free		55	35	12	22%
66	3											-	-	-	-	Free	Free		-	-	-	-	Free	Free		-	-	-	-
66	4	NBSB	X-Street	10	3	2	10	14	Yes	No	No	18	16	-	18	Free	Free		30	12	-	-	Free	Free		30	12	-	-
66	5											-	-	-	-	Free	Free		-	-	-	-	Free	Free		-	-	-	-
66	6											-	-	-	-	Free	Free		-	-	-	-	Free	Free		-	-	-	-
66	7											-	-	-	-	Free	Free		-	-	-	-	Free	Free		-	-	-	-
66	8											-	-	-	-	Free	Free		-	-	-	-	Free	Free		-	-	-	-

IntID	Phase	Movement	Phasing	Min Green	Yellow	Red Clear (All Red)	Walk	Ped Clear (FDW)	Ped Actuated?	Min Split Incl. peds?	TSP phase?	Default Min Split	Veh Min Split	Ped Min Split	Min Split	AM Pattern #	AM Cycle	AM Split (%)	AM Split (sec.)	AM Slack Time	AM TSP Time	AM TSP Time (% of ex. Split)	PM Pattern #	PM Cycle	PM Split (%)	PM Split (sec.)	PM Slack Time	PM TSP Time	PM TSP Time (% of ex. Split)
67	1											-	-	-	-	Free	Free		-	-	-	-	Free	Free		-	-	-	-
67	2	EBWB	Mainline	25	3.5	2	13	8	Yes	No	Yes	20	31	-	31	Free	Free		55	24	7	13%	Free	Free		55	24	7	13%
67	3											-	-	-	-	Free	Free		-	-	-	-	Free	Free		-	-	-	-
67	4	NBSB	X-Street	10	3.5	2	12	8	Yes	No	No	18	16	-	18	Free	Free		25	7	-	-	Free	Free		25	7	-	-
67	5											-	-	-	-	Free	Free		-	-	-	-	Free	Free		-	-	-	-
67	6											-	-	-	-	Free	Free		-	-	-	-	Free	Free		-	-	-	-
67	7											-	-	-	-	Free	Free		-	-	-	-	Free	Free		-	-	-	-
67	8											-	-	-	-	Free	Free		-	-	-	-	Free	Free		-	-	-	-
68	1											-	-	-	-	Free	Free		-	-	-	-	Free	Free		-	-	-	-
68	2	EBWB	Mainline	15	3.5	1.5	0	10	Yes	No	Yes	20	21	-	21	Free	Free		55	34	12	22%	Free	Free		55	34	12	22%
68	3											-	-	-	-	Free	Free		-	-	-	-	Free	Free		-	-	-	-
68	4	NBSB	X-Street	10	3.5	1	7	10	Yes	No	Yes	18	15	-	18	Free	Free		30	12	34	113%	Free	Free		30	12	34	113%
68	5											-	-	-	-	Free	Free		-	-	-	-	Free	Free		-	-	-	-
68	6											-	-	-	-	Free	Free		-	-	-	-	Free	Free		-	-	-	-
68	7											-	-	-	-	Free	Free		-	-	-	-	Free	Free		-	-	-	-
68	8											-	-	-	-	Free	Free		-	-	-	-	Free	Free		-	-	-	-
69	1	NBLT	P/P	4	3.5	1.5	0	0	No	No	No	11	10	-	11	2	120	17	20	9	-	-	3	90	16	14	3	-	-
69	2	SB	Mainline	15	3.5	2.5	14	10	Yes	No	Yes	20	22	-	22	2	120	53	64	42	13	21%	3	90	43	39	17	7	19%
69	3	WBLT	P/P	1	3.5	0	16	15	Yes	No	No	11	5	-	11	2	120	30	36	25	-	-	3	90	40	36	25	-	-
69	4	EB	X-Street	10	3.5	3	10	10	Yes	No	No	18	17	-	18	2	120	30	36	18	-	-	3	90	40	36	18	-	-
69	5	SBLT	P/P	4	3.5	1.5	0	0	No	No	No	11	10	-	11	2	120	11	13	2	-	-	3	90	21	19	8	-	-
69	6	NB	Mainline	15	3.5	2.5	14	10	Yes	No	No	20	22	-	22	2	120	59	71	49	-	-	3	90	39	35	13	-	-
69	7	EBLT	P/P	8	3.5	1.5	0	0	No	No	Yes	11	14	-	14	2	120	15	18	4	51	283%	3	90	18	16	2	22	135%
69	8	WB	X-Street	10	3.5	3	8	10	Yes	No	No	18	17	-	18	2	120	15	18	0	-	-	3	90	22	20	2	-	-
70	1	NB	Mainline	14	3.5	1	4	10	Yes	No	Yes	20	19	-	20	2	95	48	46	26	6	13%	3	90	45	41	21	6	16%
70	2	SBLT	P/P	12	3	1.5	10	10	Yes	No	No	11	17	-	17	2	95	22	21	4	-	-	3	90	24	22	5	-	-
70	3											-	-	-	-	2	95		-	-	-	-	3	90		-	-	-	-
70	4	EBWB	X-Street	8	3	1.5	0	7	No	No	No	18	13	-	18	2	95	26	25	7	-	-	3	90	27	24	6	-	-
70	5											-	-	-	-	2	95		-	-	-	-	3	90		-	-	-	-
70	6	SB	Mainline	5	3.5	1	7	10	Yes	No	Yes	20	10	-	20	2	95	70	67	47	2	3%	3	90	69	62	42	2	3%
70	7	Ped	Ped	1	3	0	0	0	No	No	No	18	5	-	18	2	95	5	5	0	-	-	3	90	5	5	0	-	-
70	8	Ped	Ped	5	3	1	9	8	Yes	No	No	18	10	-	18	2	95	21	20	2	-	-	3	90	22	20	2	-	-
71	1											-	-	-	-	2	120		-	-	-	-	3	90		-	-	-	-
71	2	NBSB	Mainline	15	3.5	1.5	8	11	Yes	No	Yes	20	21	-	21	2	120	72	86	65	7	8%	3	90	66	59	38	6	11%
71	3	Ped	Ped	3	3	0	0	0	No	No	No	18	7	-	18	2	120	7	8	0	-	-	3	90	7	6	0	-	-
71	4	EBWB	X-Street	10	3	3	0	7	No	No	No	18	17	-	18	2	120	21	25	7	-	-	3	90	27	24	6	-	-
71	5											-	-	-	-	2	120		-	-	-	-	3	90		-	-	-	-
71	6											-	-	-	-	2	120		-	-	-	-	3	90		-	-	-	-
71	7											-	-	-	-	2	120		-	-	-	-	3	90		-	-	-	-
71	8	Ped	Ped	5	3.5	3	18	11	Yes	No	No	18	12	-	18	2	120	28	34	16	-	-	3	90	34	31	13	-	-
72	1											-	-	-	-	2	95		-	-	-	-	3	90		-	-	-	-
72	2	NB	Mainline	12	3.5	1.5	10	12	Yes	No	Yes	20	18	-	20	2	95	82	78	58	0	0%	3	90	78	70	50	2	3%
72	3											-	-	-	-	2	95		-	-	-	-	3	90		-	-	-	-
72	4	EBWB	X-Street	8	3	2.5	14	9	Yes	No	No	18	14	-	18	2	95	18	17	0	-	-	3	90	22	20	2	-	-
72	5	NBLT	P/P	5	3.5	1.5	0	0	No	No	No	11	11	-	11	2	95	20	19	8	-	-	3	90	14	13	2	-	-
72	6	SB	Mainline	12	3.5	1.5	9	13	Yes	No	Yes	20	18	-	20	2	95	62	59	39	8	14%	3	90	64	58	38	3	6%
72	7											-	-	-	-	2	95		-	-	-	-	3	90		-	-	-	-
72	8	Ped	Ped	5	3	2.5	14	9	Yes	No	No	18	11	-	18	2	95	18	17	0	-	-	3	90	22	20	2	-	-

TSP Slack Time Analysis - Timing Data

IntID	Phase	Movement	Phasing	Min Green	Yellow	Red Clear (All Red)	Walk	Ped Clear (FDW)	Ped Actuated?	Min Split Incl. peds?	TSP phase?	Default Min Split	Veh Min Split	Ped Min Split	Min Split	AM Pattern #	AM Cycle	AM Split (%)	AM Split (sec.)	AM Slack Time	AM TSP Time	AM TSP Time (% of ex. Split)	PM Pattern #	PM Cycle	PM Split (%)	PM Split (sec.)	PM Slack Time	PM TSP Time	PM TSP Time (% of ex. Split)
73	1											-	-	-	-	2	95		-	-	-	-	3	90		-	-	-	-
73	2	NB	Mainline	20	3.5	1	7	21	Yes	No	Yes	20	25	-	25	2	95	48	46	21	0	0%	3	90	58	52	27	0	0%
73	3	EBLT	P/P	5	3	1.5	0	0	No	No	No	11	10	-	11	2	95	14	13	2	-	-	3	90	16	14	3	-	-
73	4	WB	X-Street	9	3.5	2	0	0	No	No	No	18	15	-	18	2	95	38	36	18	-	-	3	90	26	23	5	-	-
73	5											-	-	-	-	2	95		-	-	-	-	3	90		-	-	-	-
73	6	SB	Mainline	20	3.5	1	7	10	Yes	No	Yes	20	25	-	25	2	95	48	46	21	0	0%	3	90	58	52	27	0	0%
73	7											-	-	-	-	2	95		-	-	-	-	3	90		-	-	-	-
73	8	EB	X-Street	5	3	0	7	7	Yes	No	No	18	9	-	18	2	95	19	18	0	-	-	3	90	20	18	0	-	-
74	1											-	-	-	-	2	120		-	-	-	-	3	90		-	-	-	-
74	2	NBSB	Mainline	20	3.5	1.5	10	10	Yes	No	Yes	20	26	-	26	2	120	75	90	64	12	13%	3	90	68	61	35	11	18%
74	3											-	-	-	-	2	120		-	-	-	-	3	90		-	-	-	-
74	4	EBWB	X-Street	8	3	2.5	13	10	Yes	No	No	18	14	-	18	2	120	25	30	12	-	-	3	90	32	29	11	-	-
74	5											-	-	-	-	2	120		-	-	-	-	3	90		-	-	-	-
74	6											-	-	-	-	2	120		-	-	-	-	3	90		-	-	-	-
74	7											-	-	-	-	2	120		-	-	-	-	3	90		-	-	-	-
74	8											-	-	-	-	2	120		-	-	-	-	3	90		-	-	-	-
75	1	NBLT	P/P	6	3.5	1.5	0	7	No	No	No	11	12	-	12	2	95	22	21	9	-	-	3	90	17	15	3	-	-
75	2	SB	Mainline	5	3.5	1	1	11	No	Yes	Yes	20	10	17	20	2	95	27	26	6	15	60%	3	90	27	24	4	14	56%
75	3	WBLT	P/P	4	3.5	0.5	0	7	No	No	No	11	9	-	11	2	95	0	-	-	-	-	3	90	0	-	-	-	-
75	4	EB	X-Street	8	3	3	5	13	No	Yes	No	18	15	25	25	2	95	51	49	24	-	-	3	90	56	50	25	-	-
75	5	Ped	Ped	3	3	0	0	7	No	No	No	18	7	-	18	2	95	27	26	8	-	-	3	90	27	24	6	-	-
75	6	NB	Mainline	3	3.5	1	2	10	No	Yes	Yes	20	8	17	20	2	95	22	21	1	14	68%	3	90	17	15	0	17	109%
75	7	EBLT	P/P	4	3.5	0.5	0	7	No	No	No	11	9	-	11	2	95	13	12	1	-	-	3	90	10	9	0	-	-
75	8	WB	X-Street	8	3	3	5	19	No	Yes	No	18	15	31	31	2	95	38	36	5	-	-	3	90	46	41	10	-	-
76	3	SBLT	P/P	6	3	2	1	7	No	Yes	No	11	12	14	14	211	95	20	19	5	-	-	311	90	19	17	3	-	-
76	2	NB	Mainline	20	3.5	2.5	8	16	No	Yes	Yes	20	27	31	31	211	95	63	60	29	5	8%	311	90	65	59	28	3	5%
76	1											-	-	-	-	211	95		-	-	-	-	311	90		-	-	-	-
76	4	EBWB	X-Street	6	3.5	1	7	9	No	Yes	No	18	11	21	21	211	95	17	16	0	-	-	311	90	16	14	0	-	-
76	5											-	-	-	-	211	95		-	-	-	-	311	90		-	-	-	-
76	6	SB-OLA									Yes	-	-	-	-	211	95	83	79	79	0	0%	311	90	84	76	76	0	0%
76	7											-	-	-	-	211	95		-	-	-	-	311	90		-	-	-	-
76	8	Ped	Ped	6	3.5	1.5	14	10	No	Yes	No	18	12	30	30	211	95	17	16	0	-	-	311	90	16	14	0	-	-
77	1	Ped	Ped	0	3	0	0	0	No	Yes	No	18	4	-	18	2	95	0	-	-	-	-	3	90	5	5	0	-	-
77	2	NBSB	Mainline	10	3.5	1.5	2	10	No	Yes	Yes	20	16	18	20	2	95	52	49	29	0	0%	3	90	39	35	15	6	18%
77	3	EB	X-Street	6	3	1.5	5	15	No	Yes	No	18	11	25	25	2	95	20	19	0	-	-	3	90	19	17	0	-	-
77	4	WB	X-Street	12	3.5	2	13	8	No	Yes	No	18	18	27	27	2	95	28	27	0	-	-	3	90	37	33	6	-	-
77	5											-	-	-	-	2	95		-	-	-	-	3	90		-	-	-	-
77	6											-	-	-	-	2	95		-	-	-	-	3	90		-	-	-	-
77	7											-	-	-	-	2	95		-	-	-	-	3	90		-	-	-	-
77	8											-	-	-	-	2	95		-	-	-	-	3	90		-	-	-	-
78	1											-	-	-	-				-	-	-	-				-	-	-	-
78	2											-	-	-	-	-	-		-	-	-	-	-	-		-	-	-	-
78	3											-	-	-	-	-	-		-	-	-	-	-	-		-	-	-	-
78	4											-	-	-	-	-	-		-	-	-	-	-	-		-	-	-	-
78	5											-	-	-	-	-	-		-	-	-	-	-	-		-	-	-	-
78	6											-	-	-	-	-	-		-	-	-	-	-	-		-	-	-	-
78	7											-	-	-	-	-	-		-	-	-	-	-	-		-	-	-	-
78	8											-	-	-	-	-	-		-	-	-	-	-	-		-	-	-	-

TSP Slack Time Analysis - Timing Data

IntID	Phase	Movement	Phasing	Min Green	Yellow	Red Clear (All Red)	Walk	Ped Clear (FDW)	Ped Actuated?	Min Split Incl. peds?	TSP phase?	Default Min Split	Veh Min Split	Ped Min Split	Min Split	AM Pattern #	AM Cycle	AM Split (%)	AM Split (sec.)	AM Slack Time	AM TSP Time	AM TSP Time (% of ex. Split)	PM Pattern #	PM Cycle	PM Split (%)	PM Split (sec.)	PM Slack Time	PM TSP Time	PM TSP Time (% of ex. Split)
79	1	NB	Mainline	10	3.5	1	7	10	No	Yes	Yes	20	15	22	22	Free	Free		55	33	16	29%	Free	Free		55	33	16	29%
79	2	SBLT	P/P	4	3.5	1	0	10	No	Yes	No	11	9	-	11	Free	Free		21	10	-	-	Free	Free		21	10	-	-
79	3	Ped	Ped	3	3	0	0	0	No	Yes	No	18	7	-	18	Free	Free		15	0	-	-	Free	Free		15	0	-	-
79	4	EBWB	X-Street	10	3.5	1	8	11	No	Yes	No	18	15	24	24	Free	Free		30	6	-	-	Free	Free		30	6	-	-
79	5											-	-	-	-	Free	Free			-	-	-	Free	Free			-	-	-
79	6	SB-OLA									Yes	-	-	-	-	Free	Free		76	76	6	8%	Free	Free		76	76	6	8%
79	7											-	-	-	-	Free	Free			-	-	-	Free	Free			-	-	-
79	8											-	-	-	-	Free	Free			-	-	-	Free	Free			-	-	-
80	3	SBLT	P/P	4	3.5	0.5	0	0	No	Yes	No	11	9	-	11	Free	Free		17	6	-	-	Free	Free		17	6	-	-
80	2	NB	Mainline	12	3.5	1	7	11	No	Yes	Yes	20	17	23	23	Free	Free		55	32	11	20%	Free	Free		55	32	11	20%
80	1											-	-	-	-	Free	Free			-	-	-	Free	Free			-	-	-
80	4	EBWB	X-Street	6	3	1	7	10	No	Yes	No	18	11	22	22	Free	Free		27	5	-	-	Free	Free		27	5	-	-
80	5											-	-	-	-	Free	Free			-	-	-	Free	Free			-	-	-
80	6	SB-OLA									Yes	-	-	-	-	Free	Free		72	72	5	7%	Free	Free		72	72	5	7%
80	7											-	-	-	-	Free	Free			-	-	-	Free	Free			-	-	-
80	8											-	-	-	-	Free	Free			-	-	-	Free	Free			-	-	-
81	1	WBLT	P/P	4	4	1	0	7	No	Yes	No	11	10	-	11	4	100	45	45	34	-	-	5	110	29	32	21	-	-
81	2	EB	Mainline	12	3.5	1	7	12	No	Yes	Yes	20	17	24	24	4	100	24	24	0	35	146%	5	110	39	43	19	23	53%
81	3	Ped	Ped	1	3.5	0	0	7	No	Yes	No	18	5	-	18	4	100	5	5	0	-	-	5	110	5	6	0	-	-
81	4	NBSB	X-Street	8	3	1.5	0	9	No	Yes	Yes	18	13	-	18	4	100	26	26	8	7	27%	5	110	27	30	12	28	93%
81	5											-	-	-	-	4	100		-	-	-	-	5	110		-	-	-	-
81	6	WB	Mainline	12	3.5	1	7	12	No	Yes	No	20	17	24	24	4	100	31	31	7	-	-	5	110	47	52	28	-	-
81	7											-	-	-	-	4	100		-	-	-	-	5	110		-	-	-	-
81	8	Ped	Ped	5	3	1.5	14	9	No	Yes	No	18	10	28	28	4	100	29	29	1	-	-	5	110	27	30	2	-	-
82	1	WBLT	P/P	6	3	2	0	0	No	Yes	No	11	12	-	12	41	100	12	12	0	-	-	61	110	12	13	1	-	-
82	2	EB	Mainline	10	3.5	1	5	9	No	Yes	No	20	15	19	20	41	100	38	38	18	-	-	61	110	50	55	35	-	-
82	3	SBRT	X-Street	6	3.5	1	0	0	No	Yes	No	18	11	-	18	41	100	24	24	6	-	-	61	110	14	15	0	-	-
82	4	Ped	Ped	5	3.5	1	13	9	No	Yes	No	18	10	27	27	41	100	26	26	0	-	-	61	110	24	26	0	-	-
82	5	WB	Mainline	10	3.5	1	5	9	No	Yes	Yes	20	15	19	20	41	100	35	35	15	10	29%	61	110	27	30	10	28	93%
82	6	EBLT	P/P	5	3.5	1	0	0	No	Yes	No	11	10	-	11	41	100	15	15	4	-	-	61	110	35	39	28	-	-
82	7	SBLT	X-Street	8	3.5	1	0	0	No	Yes	Yes	18	13	-	18	41	100	26	26	8	18	69%	61	110	25	28	10	36	132%
82	8											-	-	-	-	41	100		-	-	-	-	61	110		-	-	-	-
83	1	WBLT	P/P	4	3.5	1.5	0	0	No	Yes	No	11	10	-	11	3	90	11	10	0	-	-	4	100	10	10	0	-	-
83	2	EB	Mainline	15	3.5	1.5	5	21	No	Yes	No	20	21	32	32	3	90	36	32	0	-	-	4	100	27	27	0	-	-
83	3	NB	X-Street	12	3.5	2	1	7	No	Yes	Yes	18	18	14	18	3	90	21	19	1	6	33%	4	100	40	40	22	0	0%
83	4	SB	X-Street	10	3.5	3	6	10	No	Yes	Yes	18	17	23	23	3	90	32	29	6	1	5%	4	100	23	23	0	22	96%
83	5											-	-	-	-	3	90		-	-	-	-	4	100		-	-	-	-
83	6	WB	Mainline	15	3.5	1.5	7	17	No	Yes	No	20	21	30	30	3	90	47	42	12	-	-	4	100	37	37	7	-	-
83	7											-	-	-	-	3	90		-	-	-	-	4	100		-	-	-	-
83	8	Ped	Ped	10	3	0	16	13	No	Yes	No	18	14	33	33	3	90	36	32	0	-	-	4	100	33	33	0	-	-
84	1											-	-	-	-	Free	Free			-	-	-	Free	Free			-	-	-
84	2	NBSB	Mainline	12	3.5	1	10	10	No	Yes	Yes	20	17	25	25	Free	Free		45	20	0	0%	Free	Free		45	20	0	0%
84	3											-	-	-	-	Free	Free			-	-	-	Free	Free			-	-	-
84	4	EBWB	X-Street	10	3.5	1	10	12	No	Yes	No	18	15	27	27	Free	Free		22	0	-	-	Free	Free		22	0	-	-
84	5											-	-	-	-	Free	Free			-	-	-	Free	Free			-	-	-
84	6											-	-	-	-	Free	Free			-	-	-	Free	Free			-	-	-
84	7											-	-	-	-	Free	Free			-	-	-	Free	Free			-	-	-
84	8											-	-	-	-	Free	Free			-	-	-	Free	Free			-	-	-

IntID	Phase	Movement	Phasing	Min Green	Yellow	Red Clear (All Red)	Walk	Ped Clear (FDW)	Ped Actuated?	Min Split Incl. peds?	TSP phase?	Default Min Split	Veh Min Split	Ped Min Split	Min Split	AM Pattern #	AM Cycle	AM Split (%)	AM Split (sec.)	AM Slack Time	AM TSP Time	AM TSP Time (% of ex. Split)	PM Pattern #	PM Cycle	PM Split (%)	PM Split (sec.)	PM Slack Time	PM TSP Time	PM TSP Time (% of ex. Split)
85	1	EBLT	P/P	4	3	1.5	0	0	No	Yes	No	11	9	-	11	3	115	46	53	42	-	-	6	100	20	20	9	-	-
85	2	WB	Mainline	10	3.5	1.5	14	11	No	Yes	Yes	20	16	31	31	3	115	24	28	0	42	152%	6	100	45	45	14	9	20%
85	3											-	-	-	-	3	115		-	-	-	-	6	100		-	-	-	-
85	4	SB	X-Street	8	3.5	3	3	10	No	Yes	No	18	15	20	20	3	115	30	35	15	-	-	6	100	35	35	15	-	-
85	5	WBLT	P/P	4	3	1.5	0	0	No	Yes	No	11	9	-	11	3	115	9	10	0	-	-	6	100	20	20	9	-	-
85	6	EB	Mainline	10	3.5	1.5	14	11	No	Yes	Yes	20	16	31	31	3	115	61	70	39	0	0%	6	100	45	45	14	9	20%
85	7											-	-	-	-	3	115		-	-	-	-	6	100		-	-	-	-
85	8	NB	X-Street	10	3.5	3	7	23	No	Yes	No	18	17	37	37	3	115	30	35	0	-	-	6	100	35	35	0	-	-
86	1	WBLT	Prot	5	3.5	2	1	12	No	Yes	No	12	11	19	19	3	115	15	17	0	-	-	6	100	30	30	11	-	-
86	2	EB	Mainline	15	3.5	2	5	21	No	Yes	Yes	20	21	32	32	3	115	54	62	30	2	3%	6	100	33	33	1	13	39%
86	3	NB	X-Street	7	3.5	3	1	6	No	Yes	No	18	14	14	18	3	115	17	20	2	-	-	6	100	20	20	2	-	-
86	4	SB	X-Street	7	3.5	1.5	7	7	No	Yes	No	18	13	20	20	3	115	14	16	0	-	-	6	100	17	17	0	-	-
86	5	EBLT	P/P	5	3.5	2	0	0	No	Yes	No	11	11	-	11	3	115	10	12	1	-	-	6	100	11	11	0	-	-
86	6	WB	Mainline	15	3.5	2	7	18	No	Yes	Yes	20	21	31	31	3	115	59	68	37	2	3%	6	100	52	52	21	2	4%
86	7	Ped	Ped	5	3	0	0	0	No	Yes	No	18	9	-	18	3	115	4	5	0	-	-	6	100	4	4	0	-	-
86	8	Ped	Ped	5	3	0	12	13	No	Yes	No	18	9	29	29	3	115	27	31	2	-	-	6	100	33	33	4	-	-
87	1											-	-	-	-				-	-	-	-				-	-	-	-
87	2											-	-	-	-	-	-		-	-	-	-	-	-		-	-	-	-
87	3											-	-	-	-	-	-		-	-	-	-	-	-		-	-	-	-
87	4											-	-	-	-	-	-		-	-	-	-	-	-		-	-	-	-
87	5											-	-	-	-	-	-		-	-	-	-	-	-		-	-	-	-
87	6											-	-	-	-	-	-		-	-	-	-	-	-		-	-	-	-
87	7											-	-	-	-	-	-		-	-	-	-	-	-		-	-	-	-
87	8											-	-	-	-	-	-		-	-	-	-	-	-		-	-	-	-
88	1											-	-	-	-				-	-	-	-				-	-	-	-
88	2											-	-	-	-	-	-		-	-	-	-	-	-		-	-	-	-
88	3											-	-	-	-	-	-		-	-	-	-	-	-		-	-	-	-
88	4											-	-	-	-	-	-		-	-	-	-	-	-		-	-	-	-
88	5											-	-	-	-	-	-		-	-	-	-	-	-		-	-	-	-
88	6											-	-	-	-	-	-		-	-	-	-	-	-		-	-	-	-
88	7											-	-	-	-	-	-		-	-	-	-	-	-		-	-	-	-
88	8											-	-	-	-	-	-		-	-	-	-	-	-		-	-	-	-
89	1	EBLT	P/P	4	3	2	0	0	No	Yes	No	11	10	-	11	3	115	13	15	4	-	-	6	100	13	13	2	-	-
89	2	WB	Mainline	10	3.5	2.5	7	19	No	Yes	Yes	20	17	33	33	3	115	58	67	34	4	6%	6	100	55	55	22	2	4%
89	3	NBLT	P/P	5	3	2	1	4	No	Yes	No	11	11	11	11	3	115	10	12	1	-	-	6	100	12	12	1	-	-
89	4	SB	X-Street	10	3	3	14	14	No	Yes	No	18	17	35	35	3	115	19	22	0	-	-	6	100	20	20	0	-	-
89	5											-	-	-	-	3	115		-	-	-	-	6	100		-	-	-	-
89	6	EB	Mainline	10	3.5	2.5	13	13	No	Yes	Yes	20	17	33	33	3	115	71	82	49	0	0%	6	100	68	68	35	0	0%
89	7											-	-	-	-	3	115		-	-	-	-	6	100		-	-	-	-
89	8	NB	X-Street	5	3	3	15	13	No	Yes	No	18	12	35	35	3	115	29	33	0	-	-	6	100	32	32	0	-	-
90	1	EBLT	P/P	5	4	1	0	0	No	Yes	Yes	11	11	-	11	211	95	13	12	1	19	156%	311	100	13	13	2	14	108%
90	2	WB	Mainline	12	4	1.5	16	10	No	Yes	No	20	18	32	32	211	95	30	29	0	-	-	311	100	37	37	5	-	-
90	3	NBLT	P/P	5	4	1.5	0	0	No	Yes	No	11	11	-	11	211	95	32	30	19	-	-	311	100	20	20	9	-	-
90	4	SB	X-Street	12	3.5	2	15	10	No	Yes	Yes	18	18	31	31	211	95	25	24	0	21	87%	311	100	30	30	0	16	53%
90	5											-	-	-	-	211	95		-	-	-	-	311	100		-	-	-	-
90	6	EB-OLC									Yes	-	-	-	-	211	95	43	41	41	19	47%	311	100	50	50	50	9	18%
90	7											-	-	-	-	211	95		-	-	-	-	311	100		-	-	-	-
90	8	NB-OLA									No	-	-	-	-	211	95	57	54	54	-	-	311	100	50	50	50	-	-

TSP Slack Time Analysis - Timing Data

IntID	Phase	Movement	Phasing	Min Green	Yellow	Red Clear (All Red)	Walk	Ped Clear (FDW)	Ped Actuated?	Min Split Incl. peds?	TSP phase?	Default Min Split	Veh Min Split	Ped Min Split	Min Split	AM Pattern #	AM Cycle	AM Split (%)	AM Split (sec.)	AM Slack Time	AM TSP Time	AM TSP Time (% of ex. Split)	PM Pattern #	PM Cycle	PM Split (%)	PM Split (sec.)	PM Slack Time	PM TSP Time	PM TSP Time (% of ex. Split)
91	1											-	-	-	-	Free	Free			-	-	-	Free	Free			-	-	-
91	2	NBSB	Mainline	18	3.5	1.5	7	14	No	Yes	Yes	20	24	27	27	Free	Free		65	38	0	0%	Free	Free		65	38	0	0%
91	3											-	-	-	-	Free	Free			-	-	-	Free	Free			-	-	-
91	4	EBWB	X-Street	10	3.5	2.5	17	10	No	Yes	No	18	17	34	34	Free	Free		33	0	-	-	Free	Free		33	0	-	-
91	5											-	-	-	-	Free	Free			-	-	-	Free	Free			-	-	-
91	6											-	-	-	-	Free	Free			-	-	-	Free	Free			-	-	-
91	7											-	-	-	-	Free	Free			-	-	-	Free	Free			-	-	-
91	8											-	-	-	-	Free	Free			-	-	-	Free	Free			-	-	-
92	1											-	-	-	-	2	95		-	-	-	-	3	100		-	-	-	-
92	2	NBSB	Mainline	15	3.5	2	7	10	No	Yes	Yes	20	21	23	23	2	95	78	74	51	0	0%	3	100	69	69	46	0	0%
92	3											-	-	-	-	2	95		-	-	-	-	3	100		-	-	-	-
92	4	EBWB	X-Street	10	3.5	2.5	16	10	No	Yes	No	18	17	33	33	2	95	22	21	0	-	-	3	100	31	31	0	-	-
92	5											-	-	-	-	2	95		-	-	-	-	3	100		-	-	-	-
92	6											-	-	-	-	2	95		-	-	-	-	3	100		-	-	-	-
92	7											-	-	-	-	2	95		-	-	-	-	3	100		-	-	-	-
92	8											-	-	-	-	2	95		-	-	-	-	3	100		-	-	-	-
93	1	NBLT	P/P	5	3.5	1	0	0	No	Yes	No	11	10	-	11	211	95	15	14	3	-	-	311	100	14	14	3	-	-
93	2	SB	Mainline	21	3.5	1.5	7	14	No	Yes	Yes	20	27	27	27	211	95	61	58	31	3	6%	311	100	57	57	30	3	5%
93	3											-	-	-	-	211	95		-	-	-	-	311	100		-	-	-	-
93	4	EBWB	X-Street	10	3.5	2	16	11	No	Yes	Yes	18	16	33	33	211	95	24	23	0	34	150%	311	100	29	29	0	33	114%
93	5											-	-	-	-	211	95		-	-	-	-	311	100		-	-	-	-
93	6	NB	Mainline	21	3.5	1.5	7	14	No	Yes	No	20	27	27	27	211	95	76	72	45	-	-	311	100	71	71	44	-	-
93	7											-	-	-	-	211	95		-	-	-	-	311	100		-	-	-	-
93	8											-	-	-	-	211	95		-	-	-	-	311	100		-	-	-	-

Rapid Bus Cost Estimate Summary

Corridor	**Corridor Improvement**			*Corridor Improvement*	**Rapid Bus Station**	**Right of Way**	**Vehicles**
	TSP	**Side Running**	**Median Busway**				
Central-East	$294,000	$288,000	$0	*$582,000*	$2,049,600	$33,600	$0
Central-West	$128,400	$202,608	$0	*$331,008*	$1,389,600	$0	$0
Central-Square	$45,600	$223,200	$0	*$268,800*	$274,800	$0	$0
East	$276,600	$618,984	$0	*$895,584*	$4,864,800	$61,600	$7,350,000
West	$128,400	$372,744	$0	*$501,144*	$3,601,200	$88,200	$0
West-FG-Univ	$100,800	$0	$8,563,200	*$8,664,000*	$1,288,800	$999,040	$0
West-CG-Univ	$100,800	$0	$0	*$100,800*	$2,214,000	$0	$0
West-FG-MP	$270,600	$0	$10,422,720	*$10,693,320*	$759,600	$896,000	$13,860,000
West-CG-MP	$270,600	$1,137,024	$0	*$1,407,624*	$1,017,600	$896,000	$11,550,000
West-Odana	$298,200	$222,624	$0	*$520,824*	$3,301,200	$0	$11,550,000
North	$193,800	$63,000	$2,100,000	*$2,356,800*	$3,110,400	$936,600	$7,350,000
South	$45,600	$0	$0	*$45,600*	$1,407,600	$82,600	$0
South-FG-ParkN	$149,400	$0	$1,674,000	*$1,823,400*	$529,200	$0	$11,340,000
South-CG-ParkN	$149,400	$0	$0	*$149,400*	$906,000	$0	$9,450,000
South-FG-ParkS	$100,800	$0	$10,693,080	*$10,793,880*	$776,400	$896,000	$0
South-CG-ParkS	$100,800	$712,872	$0	*$813,672*	$1,718,400	$896,000	$0
South-FG-Fish	$156,000	$0	$4,145,460	*$4,301,460*	$271,200	$0	$0
South-CG-Fish	$156,000	$452,232	$0	*$608,232*	$648,000	$0	$0

Corridor	**Total # of Stations**	**Total # of TSP Intersections**	**Total # of Buses**	**Total Length**	**Total Cost / Mile (2012$)**	**Total Cost / Mile (2016$)**
Central-East	4	9	0	1.13	$3,489,252	$3,927,405
Central-West	3	3	0	0.68	$3,727,662	$4,196,735
Central-Square	2	0	0	0.59	$1,369,394	$1,541,419
East	10	7	7	5.13	$3,203,729	$3,605,877
West	6	3	0	2.63	$2,353,735	$2,649,333
West-FG-Univ	3	2	0	1.35	$11,860,762	$13,349,462
West-CG-Univ	3	2	0	1.35	$2,531,233	$2,849,395
West-FG-MP	5	6	11	2.99	$11,942,188	$13,441,064
West-CG-MP	5	6	11	2.99	$6,658,845	$7,494,711
West-Odana	6	7	11	3.28	$6,332,042	$7,126,782
North	6	4	7	3.08	$6,497,686	$7,313,270
South	3	0	0	1.45	$1,561,651	$1,758,155
South-FG-ParkN	2	2	9	0.29	$53,011,200	$59,667,406
South-CG-ParkN	2	2	9	0.29	$39,620,439	$44,593,858
South-FG-ParkS	6	2	0	1.88	$11,263,396	$12,677,119
South-CG-ParkS	6	2	0	1.88	$4,140,915	$4,660,863
South-FG-Fish	2	4	0	1.19	$5,680,981	$6,394,676
South-CG-Fish	2	4	0	1.19	$1,561,051	$1,757,758

Rapid Bus Cost Estimate Summary

Central segment costs **NOT** included in North, South, West and East estimates below

Corridor	TSP	Side Running	Median Busway	*Corridor Improvement*	Rapid Bus Station	Right of Way	Vehicles
North	$193,800	$63,000	$2,100,000	*$2,356,800*	$3,110,400	$936,600	$7,350,000
South - FG	$451,800	$0	$16,512,540	*$16,964,340*	$2,984,400	$978,600	$11,340,000
South - CG	$451,800	$1,165,104	$0	*$1,616,904*	$4,680,000	$978,600	$9,450,000
Central	$468,000	$713,808	$0	*$1,181,808*	$3,714,000	$33,600	$0
East	$276,600	$618,984	$0	*$895,584*	$4,864,800	$61,600	$7,350,000
West-FG	$499,800	$372,744	$18,985,920	*$19,858,464*	$5,649,600	$1,983,240	$13,860,000
West-CG	$499,800	$1,509,768	$0	*$2,009,568*	$6,832,800	$984,200	$11,550,000
West-Odana-CG	$527,400	$595,368	$0	*$1,122,768*	$9,116,400	$88,200	$11,550,000

Central segment costs **NOT** included in North, South, West and East estimates below

Corridor	Total # of Stations	Total # of TSP Intersections	Total # of Buses	Total Length	Total Cost / Mile (2012$)	Total Cost / Mile (2016$)
Central	9	12	0	2.40	$3,037,408	$3,418,753
East	10	7	7	5.13	$3,203,729	$3,605,877
West-FG	14	11	11	6.97	$8,313,607	$9,357,149
West-CG	14	11	11	6.97	$4,236,027	$4,767,773
West-Odana-CG	15	12	11	7.26	$4,186,043	$4,711,467
North	6	4	7	3.08	$6,497,686	$7,313,270
South - FG	13	8	9	4.80	$9,513,077	$10,707,181
South - CG	13	8	9	4.80	$4,893,831	$5,508,162

Does not include the Central portion of the corridor

Central segment costs included in North, South, West and East estimates below

Corridor	TSP	Side Running	Median Busway	Corridor Improvement	Rapid Bus Station	Right of Way	Vehicles
North	$533,400	$574,200	$2,100,000	$3,207,600	$5,434,800	$970,200	$7,350,000
South - FG	$625,800	$425,808	$16,512,540	$17,564,148	$4,648,800	$978,600	$11,340,000
South - CG	$625,800	$1,590,912	$0	$2,216,712	$6,344,400	$978,600	$9,450,000
East	$616,200	$1,130,184	$0	$1,746,384	$7,189,200	$95,200	$7,350,000
West-FG	$673,800	$798,552	$18,985,920	$20,458,272	$7,314,000	$1,983,240	$13,860,000
West-CG	$673,800	$1,935,576	$0	$2,609,376	$8,497,200	$984,200	$11,550,000
West-Odana-CG	$701,400	$1,021,176	$0	$1,722,576	$10,780,800	$88,200	$11,550,000

Central segment costs included in North, South, West and East estimates below

Corridor	Total # of Stations	Total # of TSP Intersections	Total # of Buses	Total Length	Total Cost / Mile (2012$)	Total Cost / Mile (2016$)
East	16	16	7	6.84	$3,093,373	$3,481,707
West-FG	19	14	11	8.24	$7,438,935	$8,372,656
West-CG	19	14	11	8.24	$3,989,714	$4,490,507
West-Odana-CG	20	15	11	8.53	$3,955,633	$4,452,110
North	12	13	7	4.79	$5,161,233	$5,809,127
South - FG	18	11	9	6.07	$8,076,021	$9,089,702
South - CG	18	11	9	6.07	$4,422,422	$4,977,509

1. Queue jump lanes are not included as part of this estimate.
2. Local bus amenities are not included as part of this estimate.
3. Right-of-way costs are included for new/updated transfer point locations, and station locations. No additional ROW is required for the fixed guideway alternatives, unless minimum boulevards are required to be maintained.
4. Sidewalk improvements include the full reconstruction of the existing sidewalk and roadway curb/gutter within the limits of the 60’ platform.
5. Power line relocation costs are not included as part of this estimate. It is assumed that station construction would not impact the existing lines.
6. In-slab radiant heat in the platform sidewalk areas is not included as part of this estimate.
7. Each station location requires the construction of a concrete pad in the street to accommodate bus movements.
8. Existing non-signalized intersections will remain as non-signalized as part of this project. No costs associated with new traffic signal poles are included as part of the cost estimate.
9. Existing traffic signal poles have not been assumed to be relocated unless they are a single pole (no mast arm) that is located at a bumpout platform.
10. Additional site improvements are based on aerial and site photography and generally relate to potential costs associated with impacts to vertical elements that are located adjacent to proposed platform locations. There are potential costs associated with impacts to unknown elements of the site.
11. Station shelter costs are based on the shelter configuration drawings provided by SRF.

East Corridor
Length (mi) 5.13
No. of Stations 10

Item No.	Item Description	Quantity	Unit	Unit Cost	Cost	Allocated	Final Cost
Corridor Improvement					**$746,320**	**$149,264**	**$895,584**
1	Transit Signal Priority (per intersection)	7	EA	$12,000.00	$84,000	$16,800	$100,800
2	Signal Controller (per intersection)	7	EA	$11,000.00	$77,000	$15,400	$92,400
3	TSP - Bus Hardware (per bus)	7	EA	$4,500.00	$31,500	$6,300	$37,800
4	TSP Central System Upgrades	1	LS	$38,000.00	$38,000	$7,600	$45,600
5	Side Running Dedicated Lanes	8597	RF	$60.00	$515,820	$103,164	$618,984
6	Median Running Dedicated Lanes		RF	$0.00	$0	$0	$0
7	Median Busway Intersection Improvements		EA	$0.00	$0	$0	$0
Rapid Bus Station					**$4,054,000**	**$810,800**	**$4,864,800**
7	Small Shelter	12	EA	$60,000.00	$720,000	$144,000	$864,000
8	Medium Shelter	2	EA	$115,000.00	$230,000	$46,000	$276,000
9	Large Shelter	5	EA	$170,000.00	$850,000	$170,000	$1,020,000
10	60' Bus-Bulb Platform Construction (Demolition and Improvements)	0	EA	$60,000.00	$0	$0	$0
11	60' In Lane/Turn-Out Platform Construction (Demolition and Improvements)	19	EA	$40,000.00	$760,000	$152,000	$912,000
12	60’ Fixed Guideway Split-Side Platform	0	EA	$40,000.00	$0	$0	$0
13	60’ Fixed Guideway Shared Center Platform	0	EA	$20,000.00	$0	$0	$0
14	Additional Site Improvements	10	EA	$20,000.00	$200,000	$40,000	$240,000
15	Street Signage (2 per station)	38	EA	$1,000.00	$38,000	$7,600	$45,600
16	Utilities and Drainage Improvements (Minor)	8	EA	$4,000.00	$32,000	$6,400	$38,400
17	Utilities and Drainage Improvements (Major)	4	EA	$20,000.00	$80,000	$16,000	$96,000
18	Relocate Signal Pole Pedestal	0	EA	$6,000.00	$0	$0	$0
19	Install Pedestrian Push Button Pole	0	EA	$5,000.00	$0	$0	$0
20	Traffic Control	19	EA	$5,000.00	$95,000	$19,000	$114,000
21	Surface Parking	10	SPACE	$3,000.00	$30,000	$6,000	$36,000
22	Structured Parking	0	SPACE	$12,000.00	$0	$0	$0
23	Ticket Vending Machine	7	EA	$75,000.00	$525,000	$105,000	$630,000
24	Fare Enforcement Equipment (per enforcement officer)	1	EA	$4,000.00	$4,000	$800	$4,800
25	Emergency Phone	0	EA	$1,000.00	$0	$0	$0
26	Readerboards	7	EA	$25,000.00	$175,000	$35,000	$210,000
27	Security Cameras	5	EA	$20,000.00	$100,000	$20,000	$120,000
28	Wireless Connection	5	EA	$5,000.00	$25,000	$5,000	$30,000
29	Electrical Service	19	EA	$10,000.00	$190,000	$38,000	$228,000
30	Transfer Point	0	EA	$1,600,000.00	$0	$0	$0
Total Construction Costs					$4,800,320	$960,064	$5,760,384
Right of Way					**$30,800**	**$30,800**	**$61,600**
30	Commercial	4400.00	SF	$7.00	$30,800	$30,800	$61,600
31	Residential		SF	$4.00	$0	$0	$0
Vehicles					**$7,000,000**	**$350,000**	**$7,350,000**
32	Low Floor 60-foot Buses	7	EA	$1,000,000.00	$7,000,000	$350,000	$7,350,000
33	Low Floor 60-foot Buses w/ Left-Side Doors		EA	$1,200,000.00	$0	$0	$0
Soft Costs							**$2,070,949**
34	Preliminary Engineering						$192,013
35	Final Design						$358,635
36	Project Management for Design and Construction						$236,622
37	Construction Administration and Management						$384,334
38	Insurance						$192,013
39	Legal; Permits; Review Fees by Other Agencies						$49,543
40	Surveys, Testing, Investigation, Inspection						$239,086
41	Agency Force Account Work						$361,099
42	Public Art						$57,604
15% Contingency (Not Applied to Vehicle Costs)							**$1,183,940.02**
East Corridor Total Cost							**$16,426,873**

West Corridor
Length (mi) 2.63
No. of Stations 6

Item No.	Item Description	Quantity	Unit	Unit Cost	Cost	Allocated	Final Cost
Corridor Improvement					**$417,620**	**$83,524**	**$501,144**
1	Transit Signal Priority (per intersection)	3	EA	$12,000.00	$36,000	$7,200	$43,200
2	Signal Controller (per intersection)	3	EA	$11,000.00	$33,000	$6,600	$39,600
3	TSP - Bus Hardware (per bus)	0	EA	$4,500.00	$0	$0	$0
4	TSP Central System Upgrades	1	LS	$38,000.00	$38,000	$7,600	$45,600
5	Side Running Dedicated Lanes	5177	RF	$60.00	$310,620	$62,124	$372,744
6	Median Running Dedicated Lanes	0	RF	$0.00	$0	$0	$0
7	Median Busway Intersection Improvements	0	EA	$0.00	$0	$0	$0
Rapid Bus Station					**$3,001,000**	**$600,200**	**$3,601,200**
7	Small Shelter	4	EA	$60,000.00	$240,000	$48,000	$288,000
8	Medium Shelter	0	EA	$115,000.00	$0	$0	$0
9	Large Shelter	7	EA	$170,000.00	$1,190,000	$238,000	$1,428,000
10	60' Bus-Bulb Platform Construction (Demolition and Improvements)	0	EA	$60,000.00	$0	$0	$0
11	60' In Lane/Turn-Out Platform Construction (Demolition and Improvements)	11	EA	$40,000.00	$440,000	$88,000	$528,000
12	60’ Fixed Guideway Split-Side Platform	0	EA	$40,000.00	$0	$0	$0
13	60’ Fixed Guideway Shared Center Platform	0	EA	$20,000.00	$0	$0	$0
14	Additional Site Improvements	5	EA	$20,000.00	$100,000	$20,000	$120,000
15	Street Signage (2 per station)	22	EA	$1,000.00	$22,000	$4,400	$26,400
16	Utilities and Drainage Improvements (Minor)	5	EA	$4,000.00	$20,000	$4,000	$24,000
17	Utilities and Drainage Improvements (Major)	1	EA	$20,000.00	$20,000	$4,000	$24,000
18	Relocate Signal Pole Pedestal	0	EA	$6,000.00	$0	$0	$0
19	Install Pedestrian Push Button Pole	0	EA	$5,000.00	$0	$0	$0
20	Traffic Control	11	EA	$5,000.00	$55,000	$11,000	$66,000
21	Surface Parking	0	SPACE	$3,000.00	$0	$0	$0
22	Structured Parking	0	SPACE	$12,000.00	$0	$0	$0
23	Ticket Vending Machine	6	EA	$75,000.00	$450,000	$90,000	$540,000
24	Fare Enforcement Equipment (per enforcement officer)	1	EA	$4,000.00	$4,000	$800	$4,800
25	Emergency Phone	0	EA	$1,000.00	$0	$0	$0
26	Readerboards	7	EA	$25,000.00	$175,000	$35,000	$210,000
27	Security Cameras	7	EA	$20,000.00	$140,000	$28,000	$168,000
28	Wireless Connection	7	EA	$5,000.00	$35,000	$7,000	$42,000
29	Electrical Service	11	EA	$10,000.00	$110,000	$22,000	$132,000
Total Construction Costs					$3,418,620	$683,724	$4,102,344
Right of Way					**$44,100**	**$44,100**	**$88,200**
30	Commercial	6300.00	SF	$7.00	$44,100	$44,100	$88,200
31	Residential		SF	$4.00	$0	$0	$0
Vehicles					**$0**	**$0**	**$0**
32	Low Floor 60-foot Buses		EA	$1,000,000.00	$0	$0	$0
33	Low Floor 60-foot Buses w/ Left-Side Doors		EA	$1,200,000.00	$0	$0	$0
Soft Costs							**$1,182,398**
34	Preliminary Engineering						$136,745
35	Final Design						$205,999
36	Project Management for Design and Construction						$69,254
37	Construction Administration and Management						$273,931
38	Insurance						$136,745
39	Legal; Permits; Review Fees by Other Agencies						$36,391
40	Surveys, Testing, Investigation, Inspection						$72,782
41	Agency Force Account Work						$209,527
42	Public Art						$41,023
15% Contingency (Not Applied to Vehicle Costs)							**$805,941.31**
West Corridor Total Cost							**$6,178,883**

Mix Traffic Length
8684

Added 1 per Mike C's comments.

West-FG-Univ Corridor
Length (mi) 1.35
No. of Stations 3

Item No.	Item Description	Quantity	Unit	Unit Cost	Cost	Allocated	Final Cost
Corridor Improvement					**$7,220,000**	**$1,444,000**	**$8,664,000**
1	Transit Signal Priority (per intersection)	2	EA	$12,000.00	$24,000	$4,800	$28,800
2	Signal Controller (per intersection)	2	EA	$11,000.00	$22,000	$4,400	$26,400
3	TSP - Bus Hardware (per bus)	0	EA	$4,500.00	$0	$0	$0
4	TSP Central System Upgrades	1	LS	$38,000.00	$38,000	$7,600	$45,600
5	Side Running Dedicated Lanes		RF	$60.00	$0	$0	$0
6	Median Running Dedicated Lanes - University	7136	RF	$1,000.00	$7,136,000	$1,427,200	$8,563,200
7	Median Busway Intersection Improvements	3	EA	$0.00	$0	$0	$0
Rapid Bus Station					**$1,074,000**	**$214,800**	**$1,288,800**
7	Small Shelter	0	EA	$60,000.00	$0	$0	$0
8	Medium Shelter	1	EA	$115,000.00	$115,000	$23,000	$138,000
9	Large Shelter	2	EA	$170,000.00	$340,000	$68,000	$408,000
10	60' Bus-Bulb Platform Construction (Demolition and Improvements)	0	EA	$60,000.00	$0	$0	$0
11	60' In Lane/Turn-Out Platform Construction (Demolition and Improvements)	0	EA	$40,000.00	$0	$0	$0
12	60’ Fixed Guideway Split-Side Platform	0	EA	$40,000.00	$0	$0	$0
13	60’ Fixed Guideway Shared Center Platform	3	EA	$20,000.00	$60,000	$12,000	$72,000
14	Additional Site Improvements	0	EA	$20,000.00	$0	$0	$0
15	Street Signage (2 per station)	6	EA	$1,000.00	$6,000	$1,200	$7,200
16	Utilities and Drainage Improvements (Minor)	2	EA	$4,000.00	$8,000	$1,600	$9,600
17	Utilities and Drainage Improvements (Major)	0	EA	$20,000.00	$0	$0	$0
18	Relocate Signal Pole Pedestal	0	EA	$6,000.00	$0	$0	$0
19	Install Pedestrian Push Button Pole	0	EA	$5,000.00	$0	$0	$0
20	Traffic Control	3	EA	$5,000.00	$15,000	$3,000	$18,000
21	Surface Parking	0	SPACE	$3,000.00	$0	$0	$0
22	Structured Parking	0	SPACE	$12,000.00	$0	$0	$0
23	Ticket Vending Machine	5	EA	$75,000.00	$375,000	$75,000	$450,000
24	Fare Enforcement Equipment (per enforcement officer)		EA	$4,000.00	$0	$0	$0
25	Emergency Phone	0	EA	$1,000.00	$0	$0	$0
26	Readerboards	3	EA	$25,000.00	$75,000	$15,000	$90,000
27	Security Cameras	2	EA	$20,000.00	$40,000	$8,000	$48,000
28	Wireless Connection	2	EA	$5,000.00	$10,000	$2,000	$12,000
29	Electrical Service	3	EA	$10,000.00	$30,000	$6,000	$36,000
Total Construction Costs					$8,294,000	$1,658,800	$9,952,800
Right of Way					**$499,520**	**$499,520**	**$999,040**
30	Commercial	71360	SF	$7.00	$499,520	$499,520	$999,040
31	Residential		SF	$4.00	$0	$0	$0
Vehicles					**$0**	**$0**	**$0**
32	Low Floor 60-foot Buses		EA	$1,000,000.00	$0	$0	$0
33	Low Floor 60-foot Buses w/ Left-Side Doors		EA	$1,200,000.00	$0	$0	$0
Soft Costs							**$2,986,404**
34	Preliminary Engineering						$331,760
35	Final Design						$507,630
36	Project Management for Design and Construction						$175,870
37	Construction Administration and Management						$668,515
38	Insurance						$331,760
39	Legal; Permits; Review Fees by Other Agencies						$107,916
40	Surveys, Testing, Investigation, Inspection						$215,832
41	Agency Force Account Work						$547,592
42	Public Art						$99,528
15% Contingency (Not Applied to Vehicle Costs)							**$2,090,736.60**
West-FG-Univ Total Cost							**$16,028,981**

West-CG-Univ Corridor
Length (mi) 1.35
No. of Stations 3

Item No.	Item Description	Quantity	Unit	Unit Cost	Cost	Allocated	Final Cost
Corridor Improvement					**$84,000**	**$16,800**	**$100,800**
1	Transit Signal Priority (per intersection)	2	EA	$12,000.00	$24,000	$4,800	$28,800
2	Signal Controller (per intersection)	2	EA	$11,000.00	$22,000	$4,400	$26,400
3	TSP - Bus Hardware (per bus)	0	EA	$4,500.00	$0	$0	$0
4	TSP Central System Upgrades	1	LS	$38,000.00	$38,000	$7,600	$45,600
5	Side Running Dedicated Lanes	0	RF	$60.00	$0	$0	$0
6	Median Running Dedicated Lanes		RF	$0.00	$0	$0	$0
7	Median Busway Intersection Improvements		EA	$0.00	$0	$0	$0
Rapid Bus Station					**$1,845,000**	**$369,000**	**$2,214,000**
7	Small Shelter	1	EA	$60,000.00	$60,000	$12,000	$72,000
8	Medium Shelter	2	EA	$115,000.00	$230,000	$46,000	$276,000
9	Large Shelter	3	EA	$170,000.00	$510,000	$102,000	$612,000
10	60' Bus-Bulb Platform Construction (Demolition and Improvements)	0	EA	$60,000.00	$0	$0	$0
11	60' In Lane/Turn-Out Platform Construction (Demolition and Improvements)	6	EA	$40,000.00	$240,000	$48,000	$288,000
12	60’ Fixed Guideway Split-Side Platform	0	EA	$40,000.00	$0	$0	$0
13	60’ Fixed Guideway Shared Center Platform	0	EA	$20,000.00	$0	$0	$0
14	Additional Site Improvements	6	EA	$20,000.00	$120,000	$24,000	$144,000
15	Street Signage (2 per station)	12	EA	$1,000.00	$12,000	$2,400	$14,400
16	Utilities and Drainage Improvements (Minor)	2	EA	$4,000.00	$8,000	$1,600	$9,600
17	Utilities and Drainage Improvements (Major)	0	EA	$20,000.00	$0	$0	$0
18	Relocate Signal Pole Pedestal	0	EA	$6,000.00	$0	$0	$0
19	Install Pedestrian Push Button Pole	0	EA	$5,000.00	$0	$0	$0
20	Traffic Control	6	EA	$5,000.00	$30,000	$6,000	$36,000
21	Surface Parking	0	SPACE	$3,000.00	$0	$0	$0
22	Structured Parking	0	SPACE	$12,000.00	$0	$0	$0
23	Ticket Vending Machine	5	EA	$75,000.00	$375,000	$75,000	$450,000
24	Fare Enforcement Equipment (per enforcement officer)		EA	$4,000.00	$0	$0	$0
25	Emergency Phone	0	EA	$1,000.00	$0	$0	$0
26	Readerboards	5	EA	$25,000.00	$125,000	$25,000	$150,000
27	Security Cameras	3	EA	$20,000.00	$60,000	$12,000	$72,000
28	Wireless Connection	3	EA	$5,000.00	$15,000	$3,000	$18,000
29	Electrical Service	6	EA	$10,000.00	$60,000	$12,000	$72,000
Total Construction Costs					$1,929,000	$385,800	$2,314,800
Right of Way					**$0**	**$0**	**$0**
30	Commercial		SF	$7.00	$0	$0	$0
31	Residential		SF	$4.00	$0	$0	$0
Vehicles					**$0**	**$0**	**$0**
32	Low Floor 60-foot Buses		EA	$1,000,000.00	$0	$0	$0
33	Low Floor 60-foot Buses w/ Left-Side Doors		EA	$1,200,000.00	$0	$0	$0
Soft Costs							**$659,718**
34	Preliminary Engineering						$77,160
35	Final Design						$115,740
36	Project Management for Design and Construction						$38,580
37	Construction Administration and Management						$154,320
38	Insurance						$77,160
39	Legal; Permits; Review Fees by Other Agencies						$19,290
40	Surveys, Testing, Investigation, Inspection						$38,580
41	Agency Force Account Work						$115,740
42	Public Art						$23,148
15% Contingency (Not Applied to Vehicle Costs)							**$446,177.70**
West-CG-Univ Corridor Total Cost							**$3,420,696**

Mix Traffic Length
7136

West-FG-MP Corridor
Length (mi) 2.99
No. of Stations 5

Item No.	Item Description	Quantity	Unit	Unit Cost	Cost	Allocated	Final Cost
Corridor Improvement					**$8,911,100**	**$1,782,220**	**$10,693,320**
1	Transit Signal Priority (per intersection)	6	EA	$12,000.00	$72,000	$14,400	$86,400
2	Signal Controller (per intersection)	6	EA	$11,000.00	$66,000	$13,200	$79,200
3	TSP - Bus Hardware (per bus)	11	EA	$4,500.00	$49,500	$9,900	$59,400
4	TSP Central System Upgrades	1	LS	$38,000.00	$38,000	$7,600	$45,600
5	Side Running Dedicated Lanes	0	RF	$60.00	$0	$0	$0
6	Median Running Dedicated Lanes - Partial	15792	RF	$550.00	$8,685,600	$1,737,120	$10,422,720
7	Median Busway Intersection Improvements	6	EA	$0.00	$0	$0	$0
Rapid Bus Station					**$2,233,000**	**$446,600**	**$2,679,600**
7	Small Shelter	5	EA	$60,000.00	$300,000	$60,000	$360,000
8	Medium Shelter	0	EA	$115,000.00	$0	$0	$0
9	Large Shelter	0	EA	$170,000.00	$0	$0	$0
10	60' Bus-Bulb Platform Construction (Demolition and Improvements)	0	EA	$60,000.00	$0	$0	$0
11	60' In Lane/Turn-Out Platform Construction (Demolition and Improvements)	0	EA	$40,000.00	$0	$0	$0
12	60’ Fixed Guideway Split-Side Platform	0	EA	$40,000.00	$0	$0	$0
13	60’ Fixed Guideway Shared Center Platform	5	EA	$20,000.00	$100,000	$20,000	$120,000
14	Additional Site Improvements	0	EA	$20,000.00	$0	$0	$0
15	Street Signage (2 per station)	0	EA	$1,000.00	$0	$0	$0
16	Utilities and Drainage Improvements (Minor)	2	EA	$4,000.00	$8,000	$1,600	$9,600
17	Utilities and Drainage Improvements (Major)	0	EA	$20,000.00	$0	$0	$0
18	Relocate Signal Pole Pedestal	0	EA	$6,000.00	$0	$0	$0
19	Install Pedestrian Push Button Pole	0	EA	$5,000.00	$0	$0	$0
20	Traffic Control	5	EA	$5,000.00	$25,000	$5,000	$30,000
21	Surface Parking	0	SPACE	$3,000.00	$0	$0	$0
22	Structured Parking	0	SPACE	$12,000.00	$0	$0	$0
23	Ticket Vending Machine	2	EA	$75,000.00	$150,000	$30,000	$180,000
24	Fare Enforcement Equipment (per enforcement officer)		EA	$4,000.00	$0	$0	$0
25	Emergency Phone	0	EA	$1,000.00	$0	$0	$0
26	Readerboards	0	EA	$25,000.00	$0	$0	$0
27	Security Cameras	0	EA	$20,000.00	$0	$0	$0
28	Wireless Connection	0	EA	$5,000.00	$0	$0	$0
29	Electrical Service	5	EA	$10,000.00	$50,000	$10,000	$60,000
30	Transfer Point	1	EA	$1,600,000.00	$1,600,000	$320,000	$1,920,000
Total Construction Costs					$11,144,100	$2,228,820	$13,372,920
Right of Way					**$448,000**	**$448,000**	**$896,000**
30	Commercial	64000	SF	$7.00	$448,000	$448,000	$896,000
31	Residential		SF	$4.00	$0	$0	$0
Vehicles					**$13,200,000**	**$660,000**	**$13,860,000**
32	Low Floor 60-foot Buses		EA	$1,000,000.00	$0	$0	$0
33	Low Floor 60-foot Buses w/ Left-Side Doors	11	EA	$1,200,000.00	$13,200,000	$660,000	$13,860,000
Soft Costs							**$4,737,682**
34	Preliminary Engineering						$445,764
35	Final Design						$809,606
36	Project Management for Design and Construction						$495,842
37	Construction Administration and Management						$896,008
38	Insurance						$445,764
39	Legal; Permits; Review Fees by Other Agencies						$133,841
40	Surveys, Testing, Investigation, Inspection						$531,682
41	Agency Force Account Work						$845,446
42	Public Art						$133,729
15% Contingency (Not Applied to Vehicle Costs)							**$2,850,990.33**
West-FG-MP Total Cost							**$35,717,593**

Added 1 per Mike C's comments.

West-CG-MP Corridor
Length (mi) 2.99
No. of Stations 5

Item No.	Item Description	Quantity	Unit	Unit Cost	Cost	Allocated	Final Cost
Corridor Improvement					**$1,173,020**	**$234,604**	**$1,407,624**
1	Transit Signal Priority (per intersection)	6	EA	$12,000.00	$72,000	$14,400	$86,400
2	Signal Controller (per intersection)	6	EA	$11,000.00	$66,000	$13,200	$79,200
3	TSP - Bus Hardware (per bus)	11	EA	$4,500.00	$49,500	$9,900	$59,400
4	TSP Central System Upgrades	1	LS	$38,000.00	$38,000	$7,600	$45,600
5	Side Running Dedicated Lanes	15792	RF	$60.00	$947,520	$189,504	$1,137,024
6	Median Running Dedicated Lanes	0	RF	$0.00	$0	$0	$0
7	Median Busway Intersection Improvements	0	EA	$0.00	$0	$0	$0
Rapid Bus Station					**$2,448,000**	**$489,600**	**$2,937,600**
7	Small Shelter	10	EA	$60,000.00	$600,000	$120,000	$720,000
8	Medium Shelter	0	EA	$115,000.00	$0	$0	$0
9	Large Shelter	0	EA	$170,000.00	$0	$0	$0
10	60' Bus-Bulb Platform Construction (Demolition and Improvements)	0	EA	$60,000.00	$0	$0	$0
11	60' In Lane/Turn-Out Platform Construction (Demolition and Improvements)	10	EA	$40,000.00	$400,000	$80,000	$480,000
12	60’ Fixed Guideway Split-Side Platform	0	EA	$40,000.00	$0	$0	$0
13	60’ Fixed Guideway Shared Center Platform	0	EA	$20,000.00	$0	$0	$0
14	Additional Site Improvements	6	EA	$20,000.00	$120,000	$24,000	$144,000
15	Street Signage (2 per station)	20	EA	$1,000.00	$20,000	$4,000	$24,000
16	Utilities and Drainage Improvements (Minor)	2	EA	$4,000.00	$8,000	$1,600	$9,600
17	Utilities and Drainage Improvements (Major)	0	EA	$20,000.00	$0	$0	$0
18	Relocate Signal Pole Pedestal	0	EA	$6,000.00	$0	$0	$0
19	Install Pedestrian Push Button Pole	0	EA	$5,000.00	$0	$0	$0
20	Traffic Control	10	EA	$5,000.00	$50,000	$10,000	$60,000
21	Surface Parking	0	SPACE	$3,000.00	$0	$0	$0
22	Structured Parking	0	SPACE	$12,000.00	$0	$0	$0
23	Ticket Vending Machine	2	EA	$75,000.00	$150,000	$30,000	$180,000
24	Fare Enforcement Equipment (per enforcement officer)		EA	$4,000.00	$0	$0	$0
25	Emergency Phone	0	EA	$1,000.00	$0	$0	$0
26	Readerboards	0	EA	$25,000.00	$0	$0	$0
27	Security Cameras	0	EA	$20,000.00	$0	$0	$0
28	Wireless Connection	0	EA	$5,000.00	$0	$0	$0
29	Electrical Service	10	EA	$10,000.00	$100,000	$20,000	$120,000
30	Transfer Point	1	EA	$1,600,000.00	$1,600,000	$320,000	$1,920,000
Total Construction Costs					$3,621,020	$724,204	$4,345,224
Right of Way					**$448,000**	**$448,000**	**$896,000**
30	Commercial	64000	SF	$7.00	$448,000	$448,000	$896,000
31	Residential		SF	$4.00	$0	$0	$0
Vehicles					**$11,000,000**	**$550,000**	**$11,550,000**
32	Low Floor 60-foot Buses	11	EA	$1,000,000.00	$11,000,000	$550,000	$11,550,000
33	Low Floor 60-foot Buses w/ Left-Side Doors		EA	$1,200,000.00	$0	$0	$0
Soft Costs							**$2,032,789**
34	Preliminary Engineering						$144,841
35	Final Design						$336,221
36	Project Management for Design and Construction						$301,380
37	Construction Administration and Management						$294,162
38	Insurance						$144,841
39	Legal; Permits; Review Fees by Other Agencies						$58,610
40	Surveys, Testing, Investigation, Inspection						$337,220
41	Agency Force Account Work						$372,061
42	Public Art						$43,452
15% Contingency (Not Applied to Vehicle Costs)							**$1,091,101.93**
West-CG-MP Corridor Total Cost							**$19,915,115**

Added 1 per Mike C's comments.

West-Odana Corridor
Length (mi) 3.28
No. of Stations 6

Includes High Point Station

Item No.	Item Description	Quantity	Unit	Unit Cost	Cost	Allocated	Final Cost
Corridor Improvement					**$434,020**	**$86,804**	**$520,824**
1	Transit Signal Priority (per intersection)	7	EA	$12,000.00	$84,000	$16,800	$100,800
2	Signal Controller (per intersection)	7	EA	$11,000.00	$77,000	$15,400	$92,400
3	TSP - Bus Hardware (per bus)	11	EA	$4,500.00	$49,500	$9,900	$59,400
4	TSP Central System Upgrades	1	LS	$38,000.00	$38,000	$7,600	$45,600
5	Side Running Dedicated Lanes	3092	RF	$60.00	$185,520	$37,104	$222,624
6	Median Running Dedicated Lanes	0	RF	$0.00	$0	$0	$0
7	Median Busway Intersection Improvements	0	EA	$0.00	$0	$0	$0
Rapid Bus Station					**$4,351,000**	**$870,200**	**$5,221,200**
7	Small Shelter	9	EA	$60,000.00	$540,000	$108,000	$648,000
8	Medium Shelter	0	EA	$115,000.00	$0	$0	$0
9	Large Shelter	4	EA	$170,000.00	$680,000	$136,000	$816,000
10	60' Bus-Bulb Platform Construction (Demolition and Improvements)	0	EA	$60,000.00	$0	$0	$0
11	60' In Lane/Turn-Out Platform Construction (Demolition and Improvements)	13	EA	$40,000.00	$520,000	$104,000	$624,000
12	60' Fixed Guideway Split-Side Platform	0	EA	$40,000.00	$0	$0	$0
13	60' Fixed Guideway Shared Center Platform	0	EA	$20,000.00	$0	$0	$0
14	Additional Site Improvements	6	EA	$20,000.00	$120,000	$24,000	$144,000
15	Street Signage (2 per station)	26	EA	$1,000.00	$26,000	$5,200	$31,200
16	Utilities and Drainage Improvements (Minor)	0	EA	$4,000.00	$0	$0	$0
17	Utilities and Drainage Improvements (Major)	1	EA	$20,000.00	$20,000	$4,000	$24,000
18	Relocate Signal Pole Pedestal	0	EA	$6,000.00	$0	$0	$0
19	Install Pedestrian Push Button Pole	0	EA	$5,000.00	$0	$0	$0
20	Traffic Control	13	EA	$5,000.00	$65,000	$13,000	$78,000
21	Surface Parking	0	SPACE	$3,000.00	$0	$0	$0
22	Structured Parking	0	SPACE	$12,000.00	$0	$0	$0
23	Ticket Vending Machine	6	EA	$75,000.00	$450,000	$90,000	$540,000
24	Fare Enforcement Equipment (per enforcement officer)		EA	$4,000.00	$0	$0	$0
25	Emergency Phone	0	EA	$1,000.00	$0	$0	$0
26	Readerboards	4	EA	$25,000.00	$100,000	$20,000	$120,000
27	Security Cameras	4	EA	$20,000.00	$80,000	$16,000	$96,000
28	Wireless Connection	4	EA	$5,000.00	$20,000	$4,000	$24,000
29	Electrical Service	13	EA	$10,000.00	$130,000	$26,000	$156,000
30	Transfer Point	1	EA	$1,600,000.00	$1,600,000	$320,000	$1,920,000
Total Construction Costs					$4,785,020	$957,004	$5,742,024
Right of Way					**$0**	**$0**	**$0**
30	Commercial	0	SF	$7.00	$0	$0	$0
31	Residential	0	SF	$4.00	$0	$0	$0
Vehicles					**$11,000,000**	**$550,000**	**$11,550,000**
32	Low Floor 60-foot Buses	11	EA	$1,000,000.00	$11,000,000	$550,000	$11,550,000
33	Low Floor 60-foot Buses w/ Left-Side Doors		EA	$1,200,000.00	$0	$0	$0
Soft Costs							**$2,296,477**
34	Preliminary Engineering						$191,401
35	Final Design						$397,101
36	Project Management for Design and Construction						$315,700
37	Construction Administration and Management						$382,802
38	Insurance						$191,401
39	Legal; Permits; Review Fees by Other Agencies						$47,850
40	Surveys, Testing, Investigation, Inspection						$315,700
41	Agency Force Account Work						$397,101
42	Public Art						$57,420
15% Contingency (Not Applied to Vehicle Costs)							**$1,205,775.13**
West-Odana Corridors Total Cost							**$20,794,276**

Mix Traffic Length
14248

Added 1 for High Pointe per Mike C's comments.

Added 1 per Mike C's comments.

North Corridor
Length (mi) 3.08
No. of Stations 6

Item No.	Item Description	Quantity	Unit	Unit Cost	Cost	Allocated	Final Cost
Corridor Improvement					**$1,964,000**	**$392,800**	**$2,356,800**
1	Transit Signal Priority (per intersection)	4	EA	$12,000.00	$48,000	$9,600	$57,600
2	Signal Controller (per intersection)	4	EA	$11,000.00	$44,000	$8,800	$52,800
3	TSP - Bus Hardware (per bus)	7	EA	$4,500.00	$31,500	$6,300	$37,800
4	TSP Central System Upgrades	1	LS	$38,000.00	$38,000	$7,600	$45,600
5	Side Running Dedicated Lanes	875	RF	$60.00	$52,500	$10,500	$63,000
6	Median Running Dedicated Lanes - Partial	1500	RF	$550.00	$825,000	$165,000	$990,000
7	Rail Grade Crossing	1	LS	$400,000.00	$400,000	$80,000	$480,000
8	Yahara Bridge	3000	SF	$175.00	$525,000	$105,000	$630,000
9	Median Busway Intersection Improvements	0	EA	$0.00	$0	$0	$0
Rapid Bus Station					**$4,192,000**	**$838,400**	**$5,030,400**
10	Small Shelter	6	EA	$60,000.00	$360,000	$72,000	$432,000
11	Medium Shelter	2	EA	$115,000.00	$230,000	$46,000	$276,000
12	Large Shelter	3	EA	$170,000.00	$510,000	$102,000	$612,000
13	60' Bus-Bulb Platform Construction (Demolition and Improvements)		EA	$60,000.00	$0	$0	$0
14	60' In Lane/Turn-Out Platform Construction (Demolition and Improvements)	11	EA	$40,000.00	$440,000	$88,000	$528,000
15	60’ Fixed Guideway Split-Side Platform	0	EA	$40,000.00	$0	$0	$0
16	60’ Fixed Guideway Shared Center Platform	0	EA	$20,000.00	$0	$0	$0
17	Additional Site Improvements	5	EA	$20,000.00	$100,000	$20,000	$120,000
18	Street Signage (2 per station)	22	EA	$1,000.00	$22,000	$4,400	$26,400
19	Utilities and Drainage Improvements (Minor)	4	EA	$4,000.00	$16,000	$3,200	$19,200
20	Utilities and Drainage Improvements (Major)	1	EA	$20,000.00	$20,000	$4,000	$24,000
21	Relocate Signal Pole Pedestal	0	EA	$6,000.00	$0	$0	$0
22	Install Pedestrian Push Button Pole	0	EA	$5,000.00	$0	$0	$0
23	Traffic Control	11	EA	$5,000.00	$55,000	$11,000	$66,000
24	Surface Parking	0	SPACE	$3,000.00	$0	$0	$0
25	Structured Parking	0	SPACE	$12,000.00	$0	$0	$0
26	Ticket Vending Machine	7	EA	$75,000.00	$525,000	$105,000	$630,000
27	Fare Enforcement Equipment (per enforcement officer)	1	EA	$4,000.00	$4,000	$800	$4,800
28	Emergency Phone	0	EA	$1,000.00	$0	$0	$0
29	Readerboards	5	EA	$25,000.00	$125,000	$25,000	$150,000
30	Security Cameras	3	EA	$20,000.00	$60,000	$12,000	$72,000
31	Wireless Connection	3	EA	$5,000.00	$15,000	$3,000	$18,000
32	Electrical Service	11	EA	$10,000.00	$110,000	$22,000	$132,000
33	Transfer Point	1	EA	$1,600,000.00	$1,600,000	$320,000	$1,920,000
Total Construction Costs					$6,156,000	$1,231,200	$7,387,200
Right of Way					**$468,300**	**$468,300**	**$936,600**
34	Commercial	66900.00	SF	$7.00	$468,300	$468,300	$936,600
35	Residential		SF	$4.00	$0	$0	$0
Vehicles					**$7,000,000**	**$350,000**	**$7,350,000**
36	Low Floor 60-foot Buses	7	EA	$1,000,000.00	$7,000,000	$350,000	$7,350,000
37	Low Floor 60-foot Buses w/ Left-Side Doors		EA	$1,200,000.00	$0	$0	$0
Soft Costs							**$2,665,842**
38	Preliminary Engineering						$246,240
39	Final Design						$448,726
40	Project Management for Design and Construction						$272,486
41	Construction Administration and Management						$497,163
42	Insurance						$246,240
43	Legal; Permits; Review Fees by Other Agencies						$84,975
44	Surveys, Testing, Investigation, Inspection						$309,950
45	Agency Force Account Work						$486,190
46	Public Art						$73,872
15% Contingency (Not Applied to Vehicle Costs)							**$1,648,446.30**
North Corridor Total Cost							**$19,988,088**

Mix Traffic Length
15237

Added 1 per Mike C's comments.
Added 1 per Mike C's comments.

South Corridor
Length (mi) 1.45
No. of Stations 3

Item No.	Item Description	Quantity	Unit	Unit Cost	Cost	Allocated	Final Cost
Corridor Improvement					**$38,000**	**$7,600**	**$45,600**
1	Transit Signal Priority (per intersection)	0	EA	$12,000.00	$0	$0	$0
2	Signal Controller (per intersection)	0	EA	$11,000.00	$0	$0	$0
3	TSP - Bus Hardware (per bus)	0	EA	$4,500.00	$0	$0	$0
4	TSP Central System Upgrades	1	LS	$38,000.00	$38,000	$7,600	$45,600
5	Side Running Dedicated Lanes	0	RF	$60.00	$0	$0	$0
6	Median Running Dedicated Lanes	0	RF	$0.00	$0	$0	$0
7	Median Busway Intersection Improvements	0	EA	$0.00	$0	$0	$0
Rapid Bus Station					**$1,173,000**	**$234,600**	**$1,407,600**
7	Small Shelter	4	EA	$60,000.00	$240,000	$48,000	$288,000
8	Medium Shelter	0	EA	$115,000.00	$0	$0	$0
9	Large Shelter	2	EA	$170,000.00	$340,000	$68,000	$408,000
10	60' Bus-Bulb Platform Construction (Demolition and Improvements)	0	EA	$60,000.00	$0	$0	$0
11	60' In Lane/Turn-Out Platform Construction (Demolition and Improvements)	6	EA	$40,000.00	$240,000	$48,000	$288,000
12	60’ Fixed Guideway Split-Side Platform	0	EA	$40,000.00	$0	$0	$0
13	60’ Fixed Guideway Shared Center Platform	0	EA	$20,000.00	$0	$0	$0
14	Additional Site Improvements	3	EA	$20,000.00	$60,000	$12,000	$72,000
15	Street Signage (2 per station)	12	EA	$1,000.00	$12,000	$2,400	$14,400
16	Utilities and Drainage Improvements (Minor)	3	EA	$4,000.00	$12,000	$2,400	$14,400
17	Utilities and Drainage Improvements (Major)	0	EA	$20,000.00	$0	$0	$0
18	Relocate Signal Pole Pedestal	0	EA	$6,000.00	$0	$0	$0
19	Install Pedestrian Push Button Pole	0	EA	$5,000.00	$0	$0	$0
20	Traffic Control	6	EA	$5,000.00	$30,000	$6,000	$36,000
21	Surface Parking	0	SPACE	$3,000.00	$0	$0	$0
22	Structured Parking	0	SPACE	$12,000.00	$0	$0	$0
23	Ticket Vending Machine	1	EA	$75,000.00	$75,000	$15,000	$90,000
24	Fare Enforcement Equipment (per enforcement officer)	1	EA	$4,000.00	$4,000	$800	$4,800
25	Emergency Phone	0	EA	$1,000.00	$0	$0	$0
26	Readerboards	2	EA	$25,000.00	$50,000	$10,000	$60,000
27	Security Cameras	2	EA	$20,000.00	$40,000	$8,000	$48,000
28	Wireless Connection	2	EA	$5,000.00	$10,000	$2,000	$12,000
29	Electrical Service	6	EA	$10,000.00	$60,000	$12,000	$72,000
Total Construction Costs					$1,211,000	$242,200	$1,453,200
Right of Way					**$41,300**	**$41,300**	**$82,600**
30	Commercial	5900.00	SF	$7.00	$41,300	$41,300	$82,600
31	Residential		SF	$4.00	$0	$0	$0
Vehicles					**$0**	**$0**	**$0**
32	Low Floor 60-foot Buses		EA	$1,000,000.00	$0	$0	$0
33	Low Floor 60-foot Buses w/ Left-Side Doors		EA	$1,200,000.00	$0	$0	$0
Soft Costs							**$426,552**
34	Preliminary Engineering						$48,440
35	Final Design						$73,486
36	Project Management for Design and Construction						$25,046
37	Construction Administration and Management						$97,293
38	Insurance						$48,440
39	Legal; Permits; Review Fees by Other Agencies						$14,175
40	Surveys, Testing, Investigation, Inspection						$28,350
41	Agency Force Account Work						$76,790
42	Public Art						$14,532
15% Contingency (Not Applied to Vehicle Costs)							**$294,352.80**
South Corridor Total Cost							**$2,256,705**

Mix Traffic Length
7631

Added 1 per Mike C's comments.

South-FG-ParkN Corridor
Length (mi) 0.29
No. of Stations 2

Item No.	Item Description	Quantity	Unit	Unit Cost	Cost	Allocated	Final Cost
Corridor Improvement					**$1,519,500**	**$303,900**	**$1,823,400**
1	Transit Signal Priority (per intersection)	2	EA	$12,000.00	$24,000	$4,800	$28,800
2	Signal Controller (per intersection)	2	EA	$11,000.00	$22,000	$4,400	$26,400
3	TSP - Bus Hardware (per bus)	9	EA	$4,500.00	$40,500	$8,100	$48,600
4	TSP Central System Upgrades	1	LS	$38,000.00	$38,000	$7,600	$45,600
5	Side Running Dedicated Lanes	0	RF	$60.00	$0	$0	$0
6	Median Running Dedicated Lanes - Full	1550	RF	$900.00	$1,395,000	$279,000	$1,674,000
7	Median Busway Intersection Improvements	2	EA	$0.00	$0	$0	$0
Rapid Bus Station					**$441,000**	**$88,200**	**$529,200**
7	Small Shelter	1	EA	$60,000.00	$60,000	$12,000	$72,000
8	Medium Shelter	0	EA	$115,000.00	$0	$0	$0
9	Large Shelter	1	EA	$170,000.00	$170,000	$34,000	$204,000
10	60' Bus-Bulb Platform Construction (Demolition and Improvements)	0	EA	$60,000.00	$0	$0	$0
11	60' In Lane/Turn-Out Platform Construction (Demolition and Improvements)	0	EA	$40,000.00	$0	$0	$0
12	60’ Fixed Guideway Split-Side Platform	0	EA	$40,000.00	$0	$0	$0
13	60’ Fixed Guideway Shared Center Platform	2	EA	$20,000.00	$40,000	$8,000	$48,000
14	Additional Site Improvements	0	EA	$20,000.00	$0	$0	$0
15	Street Signage (2 per station)	4	EA	$1,000.00	$4,000	$800	$4,800
16	Utilities and Drainage Improvements (Minor)	3	EA	$4,000.00	$12,000	$2,400	$14,400
17	Utilities and Drainage Improvements (Major)	0	EA	$20,000.00	$0	$0	$0
18	Relocate Signal Pole Pedestal	0	EA	$6,000.00	$0	$0	$0
19	Install Pedestrian Push Button Pole	0	EA	$5,000.00	$0	$0	$0
20	Traffic Control	2	EA	$5,000.00	$10,000	$2,000	$12,000
21	Surface Parking	0	SPACE	$3,000.00	$0	$0	$0
22	Structured Parking	0	SPACE	$12,000.00	$0	$0	$0
23	Ticket Vending Machine	1	EA	$75,000.00	$75,000	$15,000	$90,000
24	Fare Enforcement Equipment (per enforcement officer)		EA	$4,000.00	$0	$0	$0
25	Emergency Phone	0	EA	$1,000.00	$0	$0	$0
26	Readerboards	1	EA	$25,000.00	$25,000	$5,000	$30,000
27	Security Cameras	1	EA	$20,000.00	$20,000	$4,000	$24,000
28	Wireless Connection	1	EA	$5,000.00	$5,000	$1,000	$6,000
29	Electrical Service	2	EA	$10,000.00	$20,000	$4,000	$24,000
Total Construction Costs					$1,960,500	$392,100	$2,352,600
Right of Way					**$0**	**$0**	**$0**
30	Commercial		SF	$7.00	$0	$0	$0
31	Residential		SF	$4.00	$0	$0	$0
Vehicles					**$10,800,000**	**$540,000**	**$11,340,000**
32	Low Floor 60-foot Buses		EA	$1,000,000.00	$0	$0	$0
33	Low Floor 60-foot Buses w/ Left-Side Doors	9	EA	$1,200,000.00	$10,800,000	$540,000	$11,340,000
Soft Costs							**$1,318,491**
34	Preliminary Engineering						$78,420
35	Final Design						$225,630
36	Project Management for Design and Construction						$255,210
37	Construction Administration and Management						$156,840
38	Insurance						$78,420
39	Legal; Permits; Review Fees by Other Agencies						$19,605
40	Surveys, Testing, Investigation, Inspection						$255,210
41	Agency Force Account Work						$225,630
42	Public Art						$23,526
15% Contingency (Not Applied to Vehicle Costs)							**$550,663.65**
South-FG-ParkN Corridor Total Cost							**$15,561,755**

South-CG-ParkN Corridor

Length (mi)	0.29
No. of Stations	2

Item No.	Item Description	Quantity	Unit	Unit Cost	Cost	Allocated	Final Cost
Corridor Improvement					**$124,500**	**$24,900**	**$149,400**
1	Transit Signal Priority (per intersection)	2	EA	$12,000.00	$24,000	$4,800	$28,800
2	Signal Controller (per intersection)	2	EA	$11,000.00	$22,000	$4,400	$26,400
3	TSP - Bus Hardware (per bus)	9	EA	$4,500.00	$40,500	$8,100	$48,600
4	TSP Central System Upgrades	1	LS	$38,000.00	$38,000	$7,600	$45,600
5	Side Running Dedicated Lanes	0	RF	$60.00	$0	$0	$0
6	Median Running Dedicated Lanes	0	RF	$0.00	$0	$0	$0
7	Median Busway Intersection Improvements	0	EA	$0.00	$0	$0	$0
Rapid Bus Station					**$755,000**	**$151,000**	**$906,000**
7	Small Shelter	3	EA	$60,000.00	$180,000	$36,000	$216,000
8	Medium Shelter	0	EA	$115,000.00	$0	$0	$0
9	Large Shelter	1	EA	$170,000.00	$170,000	$34,000	$204,000
10	60' Bus-Bulb Platform Construction (Demolition and Improvements)	0	EA	$60,000.00	$0	$0	$0
11	60' In Lane/Turn-Out Platform Construction (Demolition and Improvements)	4	EA	$40,000.00	$160,000	$32,000	$192,000
12	60’ Fixed Guideway Split-Side Platform	0	EA	$40,000.00	$0	$0	$0
13	60’ Fixed Guideway Shared Center Platform	0	EA	$20,000.00	$0	$0	$0
14	Additional Site Improvements	2	EA	$20,000.00	$40,000	$8,000	$48,000
15	Street Signage (2 per station)	8	EA	$1,000.00	$8,000	$1,600	$9,600
16	Utilities and Drainage Improvements (Minor)	3	EA	$4,000.00	$12,000	$2,400	$14,400
17	Utilities and Drainage Improvements (Major)	0	EA	$20,000.00	$0	$0	$0
18	Relocate Signal Pole Pedestal	0	EA	$6,000.00	$0	$0	$0
19	Install Pedestrian Push Button Pole	0	EA	$5,000.00	$0	$0	$0
20	Traffic Control	4	EA	$5,000.00	$20,000	$4,000	$24,000
21	Surface Parking	0	SPACE	$3,000.00	$0	$0	$0
22	Structured Parking	0	SPACE	$12,000.00	$0	$0	$0
23	Ticket Vending Machine	1	EA	$75,000.00	$75,000	$15,000	$90,000
24	Fare Enforcement Equipment (per enforcement officer)		EA	$4,000.00	$0	$0	$0
25	Emergency Phone	0	EA	$1,000.00	$0	$0	$0
26	Readerboards	1	EA	$25,000.00	$25,000	$5,000	$30,000
27	Security Cameras	1	EA	$20,000.00	$20,000	$4,000	$24,000
28	Wireless Connection	1	EA	$5,000.00	$5,000	$1,000	$6,000
29	Electrical Service	4	EA	$10,000.00	$40,000	$8,000	$48,000
Total Construction Costs					$879,500	$175,900	$1,055,400
Right of Way					**$0**	**$0**	**$0**
30	Commercial		SF	$7.00	$0	$0	$0
31	Residential		SF	$4.00	$0	$0	$0
Vehicles					**$9,000,000**	**$450,000**	**$9,450,000**
32	Low Floor 60-foot Buses	9	EA	$1,000,000.00	$9,000,000	$450,000	$9,450,000
33	Low Floor 60-foot Buses w/ Left-Side Doors		EA	$1,200,000.00	$0	$0	$0
Soft Costs							**$840,789**
34	Preliminary Engineering						$35,180
35	Final Design						$142,770
36	Project Management for Design and Construction						$197,590
37	Construction Administration and Management						$70,360
38	Insurance						$35,180
39	Legal; Permits; Review Fees by Other Agencies						$8,795
40	Surveys, Testing, Investigation, Inspection						$197,590
41	Agency Force Account Work						$142,770
42	Public Art						$10,554
15% Contingency (Not Applied to Vehicle Costs)							**$284,428.35**
South-CG-ParkN Total Cost							**$11,630,617**

Mix Traffic Length

1550

South-FG-ParkS Corridor
Length (mi) 1.88
No. of Stations 6

Item No.	Item Description	Quantity	Unit	Unit Cost	Cost	Allocated	Final Cost
Corridor Improvement					**$8,994,900**	**$1,798,980**	**$10,793,880**
1	Transit Signal Priority (per intersection)	2	EA	$12,000.00	$24,000	$4,800	$28,800
2	Signal Controller (per intersection)	2	EA	$11,000.00	$22,000	$4,400	$26,400
3	TSP - Bus Hardware (per bus)	0	EA	$4,500.00	$0	$0	$0
4	TSP Central System Upgrades	1	LS	$38,000.00	$38,000	$7,600	$45,600
5	Side Running Dedicated Lanes	0	RF	$60.00	$0	$0	$0
6	Median Running Dedicated Lanes - Full	9901	RF	$900.00	$8,910,900	$1,782,180	$10,693,080
7	Median Busway Intersection Improvements	6	EA	$0.00	$0	$0	$0
Rapid Bus Station					**$2,247,000**	**$449,400**	**$2,696,400**
7	Small Shelter	5	EA	$60,000.00	$300,000	$60,000	$360,000
8	Medium Shelter	0	EA	$115,000.00	$0	$0	$0
9	Large Shelter	0	EA	$170,000.00	$0	$0	$0
10	60' Bus-Bulb Platform Construction (Demolition and Improvements)	0	EA	$60,000.00	$0	$0	$0
11	60' In Lane/Turn-Out Platform Construction (Demolition and Improvements)	0	EA	$40,000.00	$0	$0	$0
12	60’ Fixed Guideway Split-Side Platform	0	EA	$40,000.00	$0	$0	$0
13	60’ Fixed Guideway Shared Center Platform	5	EA	$20,000.00	$100,000	$20,000	$120,000
14	Additional Site Improvements	0	EA	$20,000.00	$0	$0	$0
15	Street Signage (2 per station)	10	EA	$1,000.00	$10,000	$2,000	$12,000
16	Utilities and Drainage Improvements (Minor)	3	EA	$4,000.00	$12,000	$2,400	$14,400
17	Utilities and Drainage Improvements (Major)	0	EA	$20,000.00	$0	$0	$0
18	Relocate Signal Pole Pedestal	0	EA	$6,000.00	$0	$0	$0
19	Install Pedestrian Push Button Pole	0	EA	$5,000.00	$0	$0	$0
20	Traffic Control	5	EA	$5,000.00	$25,000	$5,000	$30,000
21	Surface Parking	0	SPACE	$3,000.00	$0	$0	$0
22	Structured Parking	0	SPACE	$12,000.00	$0	$0	$0
23	Ticket Vending Machine	2	EA	$75,000.00	$150,000	$30,000	$180,000
24	Fare Enforcement Equipment (per enforcement officer)		EA	$4,000.00	$0	$0	$0
25	Emergency Phone	0	EA	$1,000.00	$0	$0	$0
26	Readerboards	0	EA	$25,000.00	$0	$0	$0
27	Security Cameras	0	EA	$20,000.00	$0	$0	$0
28	Wireless Connection	0	EA	$5,000.00	$0	$0	$0
29	Electrical Service	5	EA	$10,000.00	$50,000	$10,000	$60,000
30	Transfer Point	1	EA	$1,600,000.00	$1,600,000	$320,000	$1,920,000
Total Construction Costs					$11,241,900	$2,248,380	$13,490,280
Right of Way					**$448,000**	**$448,000**	**$896,000**
30	Commercial	64000	SF	$7.00	$448,000	$448,000	$896,000
31	Residential		SF	$4.00	$0	$0	$0
Vehicles					**$0**	**$0**	**$0**
32	Low Floor 60-foot Buses		EA	$1,000,000.00	$0	$0	$0
33	Low Floor 60-foot Buses w/ Left-Side Doors		EA	$1,200,000.00	$0	$0	$0
Soft Costs							**$3,979,130**
34	Preliminary Engineering						$449,676
35	Final Design						$683,474
36	Project Management for Design and Construction						$233,798
37	Construction Administration and Management						$903,832
38	Insurance						$449,676
39	Legal; Permits; Review Fees by Other Agencies						$134,819
40	Surveys, Testing, Investigation, Inspection						$269,638
41	Agency Force Account Work						$719,314
42	Public Art						$134,903
15% Contingency (Not Applied to Vehicle Costs)							**$2,754,811.47**
South-FG-ParkS Total Cost							**$21,120,221**

Added 1 per Mike C's comments.

South-CG-ParkS Corridor
Length (mi) 1.88
No. of Stations 6

Item No.	Item Description	Quantity	Unit	Unit Cost	Cost	Allocated	Final Cost
Corridor Improvement					**$678,060**	**$135,612**	**$813,672**
1	Transit Signal Priority (per intersection)	2	EA	$12,000.00	$24,000	$4,800	$28,800
2	Signal Controller (per intersection)	2	EA	$11,000.00	$22,000	$4,400	$26,400
3	TSP - Bus Hardware (per bus)	0	EA	$4,500.00	$0	$0	$0
4	TSP Central System Upgrades	1	LS	$38,000.00	$38,000	$7,600	$45,600
5	Side Running Dedicated Lanes	9901	RF	$60.00	$594,060	$118,812	$712,872
6	Median Running Dedicated Lanes		RF	$0.00	$0	$0	$0
7	Median Busway Intersection Improvements		EA	$0.00	$0	$0	$0
Rapid Bus Station					**$3,032,000**	**$606,400**	**$3,638,400**
7	Small Shelter	10	EA	$60,000.00	$600,000	$120,000	$720,000
8	Medium Shelter	0	EA	$115,000.00	$0	$0	$0
9	Large Shelter	0	EA	$170,000.00	$0	$0	$0
10	60' Bus-Bulb Platform Construction (Demolition and Improvements)	0	EA	$60,000.00	$0	$0	$0
11	60' In Lane/Turn-Out Platform Construction (Demolition and Improvements)	10	EA	$40,000.00	$400,000	$80,000	$480,000
12	60’ Fixed Guideway Split-Side Platform	0	EA	$40,000.00	$0	$0	$0
13	60’ Fixed Guideway Shared Center Platform	0	EA	$20,000.00	$0	$0	$0
14	Additional Site Improvements	5	EA	$20,000.00	$100,000	$20,000	$120,000
15	Street Signage (2 per station)	20	EA	$1,000.00	$20,000	$4,000	$24,000
16	Utilities and Drainage Improvements (Minor)	3	EA	$4,000.00	$12,000	$2,400	$14,400
17	Utilities and Drainage Improvements (Major)	0	EA	$20,000.00	$0	$0	$0
18	Relocate Signal Pole Pedestal	0	EA	$6,000.00	$0	$0	$0
19	Install Pedestrian Push Button Pole	0	EA	$5,000.00	$0	$0	$0
20	Traffic Control	10	EA	$5,000.00	$50,000	$10,000	$60,000
21	Surface Parking	0	SPACE	$3,000.00	$0	$0	$0
22	Structured Parking	0	SPACE	$12,000.00	$0	$0	$0
23	Ticket Vending Machine	2	EA	$75,000.00	$150,000	$30,000	$180,000
24	Fare Enforcement Equipment (per enforcement officer)		EA	$4,000.00	$0	$0	$0
25	Emergency Phone	0	EA	$1,000.00	$0	$0	$0
26	Readerboards	0	EA	$25,000.00	$0	$0	$0
27	Security Cameras	0	EA	$20,000.00	$0	$0	$0
28	Wireless Connection	0	EA	$5,000.00	$0	$0	$0
29	Electrical Service	10	EA	$10,000.00	$100,000	$20,000	$120,000
30	Transfer Point	1	EA	$1,600,000.00	$1,600,000	$320,000	$1,920,000
Total Construction Costs					$3,710,060	$742,012	$4,452,072
Right of Way					**$448,000**	**$448,000**	**$896,000**
30	Commercial	64000	SF	$7.00	$448,000	$448,000	$896,000
31	Residential		SF	$4.00	$0	$0	$0
Vehicles					**$0**	**$0**	**$0**
32	Low Floor 60-foot Buses		EA	$1,000,000.00	$0	$0	$0
33	Low Floor 60-foot Buses w/ Left-Side Doors		EA	$1,200,000.00	$0	$0	$0
Soft Costs							**$1,403,241**
34	Preliminary Engineering						$148,402
35	Final Design						$231,564
36	Project Management for Design and Construction						$83,161
37	Construction Administration and Management						$301,285
38	Insurance						$148,402
39	Legal; Permits; Review Fees by Other Agencies						$59,501
40	Surveys, Testing, Investigation, Inspection						$119,001
41	Agency Force Account Work						$267,404
42	Public Art						$44,521
15% Contingency (Not Applied to Vehicle Costs)							**$1,012,696.88**
South-CG-ParkS Corridor Total Cost							**$7,764,009**

Added 1 per Mike C's comments.

South-FG-Fish Corridor
Length (mi) 1.19
No. of Stations 2

Item No.	Item Description	Quantity	Unit	Unit Cost	Cost	Allocated	Final Cost
Corridor Improvement					**$3,584,550**	**$716,910**	**$4,301,460**
1	Transit Signal Priority (per intersection)	4	EA	$12,000.00	$48,000	$9,600	$57,600
2	Signal Controller (per intersection)	4	EA	$11,000.00	$44,000	$8,800	$52,800
3	TSP - Bus Hardware (per bus)	0	EA	$4,500.00	$0	$0	$0
4	TSP Central System Upgrades	1	LS	$38,000.00	$38,000	$7,600	$45,600
5	Side Running Dedicated Lanes	0	RF	$60.00	$0	$0	$0
6	Median Running Dedicated Lanes - Partial	6281	RF	$550.00	$3,454,550	$690,910	$4,145,460
7	Median Busway Intersection Improvements	2	EA	$0.00	$0	$0	$0
Rapid Bus Station					**$226,000**	**$45,200**	**$271,200**
7	Small Shelter	2	EA	$60,000.00	$120,000	$24,000	$144,000
8	Medium Shelter	0	EA	$115,000.00	$0	$0	$0
9	Large Shelter	0	EA	$170,000.00	$0	$0	$0
10	60' Bus-Bulb Platform Construction (Demolition and Improvements)	0	EA	$60,000.00	$0	$0	$0
11	60' In Lane/Turn-Out Platform Construction (Demolition and Improvements)	0	EA	$40,000.00	$0	$0	$0
12	60’ Fixed Guideway Split-Side Platform	0	EA	$40,000.00	$0	$0	$0
13	60’ Fixed Guideway Shared Center Platform	2	EA	$20,000.00	$40,000	$8,000	$48,000
14	Additional Site Improvements	0	EA	$20,000.00	$0	$0	$0
15	Street Signage (2 per station)	4	EA	$1,000.00	$4,000	$800	$4,800
16	Utilities and Drainage Improvements (Minor)	3	EA	$4,000.00	$12,000	$2,400	$14,400
17	Utilities and Drainage Improvements (Major)	1	EA	$20,000.00	$20,000	$4,000	$24,000
18	Relocate Signal Pole Pedestal	0	EA	$6,000.00	$0	$0	$0
19	Install Pedestrian Push Button Pole	0	EA	$5,000.00	$0	$0	$0
20	Traffic Control	2	EA	$5,000.00	$10,000	$2,000	$12,000
21	Surface Parking	0	SPACE	$3,000.00	$0	$0	$0
22	Structured Parking	0	SPACE	$12,000.00	$0	$0	$0
23	Ticket Vending Machine	0	EA	$75,000.00	$0	$0	$0
24	Fare Enforcement Equipment (per enforcement officer)		EA	$4,000.00	$0	$0	$0
25	Emergency Phone	0	EA	$1,000.00	$0	$0	$0
26	Readerboards	0	EA	$25,000.00	$0	$0	$0
27	Security Cameras	0	EA	$20,000.00	$0	$0	$0
28	Wireless Connection	0	EA	$5,000.00	$0	$0	$0
29	Electrical Service	2	EA	$10,000.00	$20,000	$4,000	$24,000
Total Construction Costs					$3,810,550	$762,110	$4,572,660
Right of Way					**$0**	**$0**	**$0**
30	Commercial		SF	$7.00	$0	$0	$0
31	Residential		SF	$4.00	$0	$0	$0
Vehicles					**$0**	**$0**	**$0**
32	Low Floor 60-foot Buses		EA	$1,000,000.00	$0	$0	$0
33	Low Floor 60-foot Buses w/ Left-Side Doors		EA	$1,200,000.00	$0	$0	$0
Soft Costs							**$1,303,208**
34	Preliminary Engineering						$152,422
35	Final Design						$228,633
36	Project Management for Design and Construction						$76,211
37	Construction Administration and Management						$304,844
38	Insurance						$152,422
39	Legal; Permits; Review Fees by Other Agencies						$38,106
40	Surveys, Testing, Investigation, Inspection						$76,211
41	Agency Force Account Work						$228,633
42	Public Art						$45,727
15% Contingency (Not Applied to Vehicle Costs)							**$881,380.22**
South-FG-Fish Corridor Total Cost							**$6,757,248**

South-CG-Fish Corridor
Length (mi) 1.19
No. of Stations 2

Item No.	Item Description	Quantity	Unit	Unit Cost	Cost	Allocated	Final Cost
Corridor Improvement					**$506,860**	**$101,372**	**$608,232**
1	Transit Signal Priority (per intersection)	4	EA	$12,000.00	$48,000	$9,600	$57,600
2	Signal Controller (per intersection)	4	EA	$11,000.00	$44,000	$8,800	$52,800
3	TSP - Bus Hardware (per bus)	0	EA	$4,500.00	$0	$0	$0
4	TSP Central System Upgrades	1	LS	$38,000.00	$38,000	$7,600	$45,600
5	Side Running Dedicated Lanes	6281	RF	$60.00	$376,860	$75,372	$452,232
6	Median Running Dedicated Lanes	0	RF	$0.00	$0	$0	$0
7	Median Busway Intersection Improvements	0	EA	$0.00	$0	$0	$0
Rapid Bus Station					**$540,000**	**$108,000**	**$648,000**
7	Small Shelter	4	EA	$60,000.00	$240,000	$48,000	$288,000
8	Medium Shelter	0	EA	$115,000.00	$0	$0	$0
9	Large Shelter	0	EA	$170,000.00	$0	$0	$0
10	60' Bus-Bulb Platform Construction (Demolition and Improvements)	0	EA	$60,000.00	$0	$0	$0
11	60' In Lane/Turn-Out Platform Construction (Demolition and Improvements)	4	EA	$40,000.00	$160,000	$32,000	$192,000
12	60’ Fixed Guideway Split-Side Platform	0	EA	$40,000.00	$0	$0	$0
13	60’ Fixed Guideway Shared Center Platform	0	EA	$20,000.00	$0	$0	$0
14	Additional Site Improvements	2	EA	$20,000.00	$40,000	$8,000	$48,000
15	Street Signage (2 per station)	8	EA	$1,000.00	$8,000	$1,600	$9,600
16	Utilities and Drainage Improvements (Minor)	3	EA	$4,000.00	$12,000	$2,400	$14,400
17	Utilities and Drainage Improvements (Major)	1	EA	$20,000.00	$20,000	$4,000	$24,000
18	Relocate Signal Pole Pedestal	0	EA	$6,000.00	$0	$0	$0
19	Install Pedestrian Push Button Pole	0	EA	$5,000.00	$0	$0	$0
20	Traffic Control	4	EA	$5,000.00	$20,000	$4,000	$24,000
21	Surface Parking	0	SPACE	$3,000.00	$0	$0	$0
22	Structured Parking	0	SPACE	$12,000.00	$0	$0	$0
23	Ticket Vending Machine	0	EA	$75,000.00	$0	$0	$0
24	Fare Enforcement Equipment (per enforcement officer)		EA	$4,000.00	$0	$0	$0
25	Emergency Phone	0	EA	$1,000.00	$0	$0	$0
26	Readerboards	0	EA	$25,000.00	$0	$0	$0
27	Security Cameras	0	EA	$20,000.00	$0	$0	$0
28	Wireless Connection	0	EA	$5,000.00	$0	$0	$0
29	Electrical Service	4	EA	$10,000.00	$40,000	$8,000	$48,000
Total Construction Costs					$1,046,860	$209,372	$1,256,232
Right of Way					**$0**	**$0**	**$0**
30	Commercial		SF	$7.00	$0	$0	$0
31	Residential		SF	$4.00	$0	$0	$0
Vehicles					**$0**	**$0**	**$0**
32	Low Floor 60-foot Buses		EA	$1,000,000.00	$0	$0	$0
33	Low Floor 60-foot Buses w/ Left-Side Doors		EA	$1,200,000.00	$0	$0	$0
Soft Costs							**$358,026**
34	Preliminary Engineering						$41,874
35	Final Design						$62,812
36	Project Management for Design and Construction						$20,937
37	Construction Administration and Management						$83,749
38	Insurance						$41,874
39	Legal; Permits; Review Fees by Other Agencies						$10,469
40	Surveys, Testing, Investigation, Inspection						$20,937
41	Agency Force Account Work						$62,812
42	Public Art						$12,562
15% Contingency (Not Applied to Vehicle Costs)							**$242,138.72**
South-CG-Fish Corridor Total Cost							**$1,856,397**

Central-East
Length (mi) 1.13
No. of Stations 4

Item No.	Item Description	Quantity	Unit	Unit Cost	Cost	Allocated	Final Cost
Corridor Improvement					**$485,000**	**$97,000**	**$582,000**
1	Transit Signal Priority (per intersection)	9	EA	$12,000.00	$108,000	$21,600	$129,600
2	Signal Controller (per intersection)	9	EA	$11,000.00	$99,000	$19,800	$118,800
3	TSP - Bus Hardware (per bus)	0	EA	$4,500.00	$0	$0	$0
4	TSP Central System Upgrades	1	LS	$38,000.00	$38,000	$7,600	$45,600
5	Side Running Dedicated Lanes	4000	RF	$60.00	$240,000	$48,000	$288,000
6	Median Running Dedicated Lanes	0	RF	$0.00	$0	$0	$0
7	Median Busway Intersection Improvements	0	EA	$0.00	$0	$0	$0
Rapid Bus Station					**$1,708,000**	**$341,600**	**$2,049,600**
7	Small Shelter	4	EA	$60,000.00	$240,000	$48,000	$288,000
8	Medium Shelter	4	EA	$115,000.00	$460,000	$92,000	$552,000
9	Large Shelter	0	EA	$170,000.00	$0	$0	$0
10	60' Bus-Bulb Platform Construction (Demolition and Improvements)	0	EA	$60,000.00	$0	$0	$0
11	60' In Lane/Turn-Out Platform Construction (Demolition and Improvements)	8	EA	$40,000.00	$320,000	$64,000	$384,000
12	60’ Fixed Guideway Split-Side Platform	0	EA	$40,000.00	$0	$0	$0
13	60’ Fixed Guideway Shared Center Platform	0	EA	$20,000.00	$0	$0	$0
14	Additional Site Improvements	4	EA	$20,000.00	$80,000	$16,000	$96,000
15	Street Signage (2 per station)	16	EA	$1,000.00	$16,000	$3,200	$19,200
16	Utilities and Drainage Improvements (Minor)	3	EA	$4,000.00	$12,000	$2,400	$14,400
17	Utilities and Drainage Improvements (Major)	3	EA	$20,000.00	$60,000	$12,000	$72,000
18	Relocate Signal Pole Pedestal	0	EA	$6,000.00	$0	$0	$0
19	Install Pedestrian Push Button Pole	0	EA	$5,000.00	$0	$0	$0
20	Traffic Control	8	EA	$5,000.00	$40,000	$8,000	$48,000
21	Surface Parking	0	SPACE	$3,000.00	$0	$0	$0
22	Structured Parking	0	SPACE	$12,000.00	$0	$0	$0
23	Ticket Vending Machine	4	EA	$75,000.00	$300,000	$60,000	$360,000
24	Fare Enforcement Equipment (per enforcement officer)		EA	$4,000.00	$0	$0	$0
25	Emergency Phone	0	EA	$1,000.00	$0	$0	$0
26	Readerboards	4	EA	$25,000.00	$100,000	$20,000	$120,000
27	Security Cameras	0	EA	$20,000.00	$0	$0	$0
28	Wireless Connection	0	EA	$5,000.00	$0	$0	$0
29	Electrical Service	8	EA	$10,000.00	$80,000	$16,000	$96,000
Total Construction Costs					$2,193,000	$438,600	$2,631,600
Right of Way					**$16,800**	**$16,800**	**$33,600**
30	Commercial	2400	SF	$7.00	$16,800	$16,800	$33,600
31	Residential	0	SF	$4.00	$0	$0	$0
Vehicles					**$0**	**$0**	**$0**
32	Low Floor 60-foot Buses		EA	$1,000,000.00	$0	$0	$0
33	Low Floor 60-foot Buses w/ Left-Side Doors		EA	$1,200,000.00	$0	$0	$0
Soft Costs							**$755,046**
34	Preliminary Engineering						$87,720
35	Final Design						$131,916
36	Project Management for Design and Construction						$44,196
37	Construction Administration and Management						$175,608
38	Insurance						$87,720
39	Legal; Permits; Review Fees by Other Agencies						$22,770
40	Surveys, Testing, Investigation, Inspection						$45,540
41	Agency Force Account Work						$133,260
42	Public Art						$26,316
15% Contingency (Not Applied to Vehicle Costs)							**$513,036.90**
Central-East Corridor Total Cost							**$3,933,283**

Mix Traffic Length
1953

Central-West	
Length (mi)	0.68
No. of Stations	3

Item No.	Item Description	Quantity	Unit	Unit Cost	Cost	Allocated	Final Cost
Corridor Improvement					**$275,840**	**$55,168**	**$331,008**
1	Transit Signal Priority (per intersection)	3	EA	$12,000.00	$36,000	$7,200	$43,200
2	Signal Controller (per intersection)	3	EA	$11,000.00	$33,000	$6,600	$39,600
3	TSP - Bus Hardware (per bus)	0	EA	$4,500.00	$0	$0	$0
4	TSP Central System Upgrades	1	LS	$38,000.00	$38,000	$7,600	$45,600
5	Side Running Dedicated Lanes	2814	RF	$60.00	$168,840	$33,768	$202,608
6	Median Running Dedicated Lanes	0	RF	$0.00	$0	$0	$0
7	Median Busway Intersection Improvements	0	EA	$0.00	$0	$0	$0
Rapid Bus Station					**$1,158,000**	**$231,600**	**$1,389,600**
7	Small Shelter	0	EA	$60,000.00	$0	$0	$0
8	Medium Shelter	1	EA	$115,000.00	$115,000	$23,000	$138,000
9	Large Shelter	2	EA	$170,000.00	$340,000	$68,000	$408,000
10	60' Bus-Bulb Platform Construction (Demolition and Improvements)	0	EA	$60,000.00	$0	$0	$0
11	60' In Lane/Turn-Out Platform Construction (Demolition and Improvements)	3	EA	$40,000.00	$120,000	$24,000	$144,000
12	60’ Fixed Guideway Split-Side Platform	0	EA	$40,000.00	$0	$0	$0
13	60’ Fixed Guideway Shared Center Platform	0	EA	$20,000.00	$0	$0	$0
14	Additional Site Improvements	1	EA	$20,000.00	$20,000	$4,000	$24,000
15	Street Signage (2 per station)	6	EA	$1,000.00	$6,000	$1,200	$7,200
16	Utilities and Drainage Improvements (Minor)	3	EA	$4,000.00	$12,000	$2,400	$14,400
17	Utilities and Drainage Improvements (Major)	0	EA	$20,000.00	$0	$0	$0
18	Relocate Signal Pole Pedestal	0	EA	$6,000.00	$0	$0	$0
19	Install Pedestrian Push Button Pole	0	EA	$5,000.00	$0	$0	$0
20	Traffic Control	3	EA	$5,000.00	$15,000	$3,000	$18,000
21	Surface Parking	0	SPACE	$3,000.00	$0	$0	$0
22	Structured Parking	0	SPACE	$12,000.00	$0	$0	$0
23	Ticket Vending Machine	5	EA	$75,000.00	$375,000	$75,000	$450,000
24	Fare Enforcement Equipment (per enforcement officer)		EA	$4,000.00	$0	$0	$0
25	Emergency Phone	0	EA	$1,000.00	$0	$0	$0
26	Readerboards	3	EA	$25,000.00	$75,000	$15,000	$90,000
27	Security Cameras	2	EA	$20,000.00	$40,000	$8,000	$48,000
28	Wireless Connection	2	EA	$5,000.00	$10,000	$2,000	$12,000
29	Electrical Service	3	EA	$10,000.00	$30,000	$6,000	$36,000
Total Construction Costs					$1,433,840	$286,768	$1,720,608
Right of Way					**$0**	**$0**	**$0**
30	Commercial	0	SF	$7.00	$0	$0	$0
31	Residential	0	SF	$4.00	$0	$0	$0
Vehicles					**$0**	**$0**	**$0**
32	Low Floor 60-foot Buses		EA	$1,000,000.00	$0	$0	$0
33	Low Floor 60-foot Buses w/ Left-Side Doors		EA	$1,200,000.00	$0	$0	$0
Soft Costs							**$490,373**
34	Preliminary Engineering						$57,354
35	Final Design						$86,030
36	Project Management for Design and Construction						$28,677
37	Construction Administration and Management						$114,707
38	Insurance						$57,354
39	Legal; Permits; Review Fees by Other Agencies						$14,338
40	Surveys, Testing, Investigation, Inspection						$28,677
41	Agency Force Account Work						$86,030
42	Public Art						$17,206
15% Contingency (Not Applied to Vehicle Costs)							**$331,647.19**
Central-West Corridor Total Cost							**$2,542,628**

Mix Traffic Length
1577

Central-Square	
Length (mi)	0.59
No. of Stations	2

Item No.	Item Description	Quantity	Unit	Unit Cost	Cost	Allocated	Final Cost
Corridor Improvement					**$224,000**	**$44,800**	**$268,800**
1	Transit Signal Priority (per intersection)	0	EA	$12,000.00	$0	$0	$0
2	Signal Controller (per intersection)	0	EA	$11,000.00	$0	$0	$0
3	TSP - Bus Hardware (per bus)	0	EA	$4,500.00	$0	$0	$0
4	TSP Central System Upgrades	1	LS	$38,000.00	$38,000	$7,600	$45,600
5	Side Running Dedicated Lanes	3100	RF	$60.00	$186,000	$37,200	$223,200
6	Median Running Dedicated Lanes	0	RF	$0.00	$0	$0	$0
7	Median Busway Intersection Improvements	0	EA	$0.00	$0	$0	$0
Rapid Bus Station					**$229,000**	**$45,800**	**$274,800**
7	Small Shelter	0	EA	$60,000.00	$0	$0	$0
8	Medium Shelter	0	EA	$115,000.00	$0	$0	$0
9	Large Shelter	0	EA	$170,000.00	$0	$0	$0
10	60' Bus-Bulb Platform Construction (Demolition and Improvements)	0	EA	$60,000.00	$0	$0	$0
11	60' In Lane/Turn-Out Platform Construction (Demolition and Improvements)	0	EA	$40,000.00	$0	$0	$0
12	60’ Fixed Guideway Split-Side Platform	0	EA	$40,000.00	$0	$0	$0
13	60’ Fixed Guideway Shared Center Platform	0	EA	$20,000.00	$0	$0	$0
14	Additional Site Improvements	0	EA	$20,000.00	$0	$0	$0
15	Street Signage (2 per station)	4	EA	$1,000.00	$4,000	$800	$4,800
16	Utilities and Drainage Improvements (Minor)	0	EA	$4,000.00	$0	$0	$0
17	Utilities and Drainage Improvements (Major)	0	EA	$20,000.00	$0	$0	$0
18	Relocate Signal Pole Pedestal	0	EA	$6,000.00	$0	$0	$0
19	Install Pedestrian Push Button Pole	0	EA	$5,000.00	$0	$0	$0
20	Traffic Control	0	EA	$5,000.00	$0	$0	$0
21	Surface Parking	0	SPACE	$3,000.00	$0	$0	$0
22	Structured Parking	0	SPACE	$12,000.00	$0	$0	$0
23	Ticket Vending Machine	3	EA	$75,000.00	$225,000	$45,000	$270,000
24	Fare Enforcement Equipment (per enforcement officer)		EA	$4,000.00	$0	$0	$0
25	Emergency Phone	0	EA	$1,000.00	$0	$0	$0
26	Readerboards	0	EA	$25,000.00	$0	$0	$0
27	Security Cameras	0	EA	$20,000.00	$0	$0	$0
28	Wireless Connection	0	EA	$5,000.00	$0	$0	$0
29	Electrical Service	0	EA	$10,000.00	$0	$0	$0
Total Construction Costs					$453,000	$90,600	$543,600
Right of Way					**$0**	**$0**	**$0**
30	Commercial	0	SF	$7.00	$0	$0	$0
31	Residential	0	SF	$4.00	$0	$0	$0
Vehicles					**$0**	**$0**	**$0**
32	Low Floor 60-foot Buses		EA	$1,000,000.00	$0	$0	$0
33	Low Floor 60-foot Buses w/ Left-Side Doors		EA	$1,200,000.00	$0	$0	$0
Soft Costs							**$154,926**
34	Preliminary Engineering						$18,120
35	Final Design						$27,180
36	Project Management for Design and Construction						$9,060
37	Construction Administration and Management						$36,240
38	Insurance						$18,120
39	Legal; Permits; Review Fees by Other Agencies						$4,530
40	Surveys, Testing, Investigation, Inspection						$9,060
41	Agency Force Account Work						$27,180
42	Public Art						$5,436
15% Contingency (Not Applied to Vehicle Costs)							**$104,778.90**
Central-Square Corridor Total Cost							**$803,305**

Mix Traffic Length
0

Added 1 per Mike C's comments.

Item No.	Description	Unit	Unit Price
Corridor Improvement			
1	Transit Signal Priority (per intersection)	EA	$ 12,000
2	Signal Controller (per intersection)	EA	$ 11,000
3	TSP - Bus Hardware (per bus)	EA	$ 4,500
4	TSP Central System Upgrades	LS	$ 38,000
5	Side Running Dedicated Lanes	RF	$ 60
6	Median Running Dedicated Lanes	RF	$ -
7	Median Running Dedicated Lanes - Full	RF	$ 900
8	Median Running Dedicated Lanes - Partial	RF	$ 550
9	Median Running Dedicated Lanes - University	RF	$ 1,000
10	Median Busway Intersection Improvements	EA	
Rapid Bus Station			
11	Small Shelter	EA	$ 60,000
12	Medium Shelter	EA	$ 115,000
13	Large Shelter	EA	$ 170,000
14	60' Bus-Bulb Platform Construction (Demolition and Improvements)	EA	$ 60,000
15	60' In Lane/Turn-Out Platform Construction (Demolition and Improvements)	EA	$ 40,000
16	60’ Fixed Guideway Split-Side Platform	EA	$ 40,000
17	60’ Fixed Guideway Shared Center Platform	EA	$ 20,000
18	Additional Site Improvements	EA	$ 20,000
19	Street Signage (2 per station)	EA	$ 1,000
20	Utilities and Drainage Improvements (Minor)	EA	$ 4,000
21	Utilities and Drainage Improvements (Major)	EA	$ 20,000
22	Relocate Signal Pole Pedestal	EA	$ 6,000
23	Install Pedestrian Push Button Pole	EA	$ 5,000
24	Traffic Control	EA	$ 5,000
25	Surface Parking	SPACE	$ 3,000
26	Structured Parking	SPACE	$ 12,000
27	Ticket Vending Machine	EA	$ 75,000
28	Fare Enforcement Equipment (per enforcement officer)	EA	$ 4,000
29	Emergency Phone	EA	$ 1,000
30	Readerboards	EA	$ 25,000
31	Security Cameras	EA	$ 20,000
32	Wireless Connection	EA	$ 5,000
33	Electrical Service	EA	$ 10,000
34	Transfer Point	EA	$ 1,600,000
Right of Way			
35	Commercial	SF	$ 7
36	Residential	SF	$ 4
Vehicles			
37	Low Floor 60-foot Buses	EA	$ 1,000,000
38	Low Floor 60-foot Buses w/ Left-Side Doors	EA	$ 1,200,000

Madison BRT Transit Corridor Study
O&M Cost Estimates

This paper presents annual O&M cost estimates for possible BRT service in the Madison area. O&M costs have been estimated for BRT service and for potential modifications to background Metro bus service. O&M cost estimates follow methodology specified in a prior working paper.

BRT Operating Statistics

This project has evaluated potential BRT service in four corridors (East, North, South and West). Two alignment options have been carried forward for the West Corridor (Mineral Point Road and Odana Road). Table 1 presents estimates of BRT operating statistics (peak/fleet vehicles, annual revenue bus-hours and bus-miles of service) for each individual corridor.

In addition to annual revenue bus-hours and bus-miles of service (provided in Table 1 for each corridor), the BRT O&M cost methodology requires the number of directional BRT stops and the number of Ticket Vending Machines (TVMs) as input. Estimated TVMs and directional BRT stops are based on alignment plans, and do not include stops at Transfer Points (since BRT service would likely utilize an existing bay at those locations). Estimated TVMs and new BRT stops are noted below:

Corridor	TVMs	Directional BRT Stops
East	13	29
North	12	20
South	10	31
West: Mineral Pt. Road	21	33
West: Odana Road	23	37

Background Bus Operating Statistics

A separate paper described proposed changes to the background bus system. This was used to estimate changes in background bus operating statistics. Table 2 summarizes changes in bus statistics by corridor. Appendix A presents estimated changes in bus statistics by bus route.

O&M Cost Estimates

Tables 3 through 7 present estimates of bus O&M costs by corridor. These tables present anticipated bus cost savings from proposed changes to the background bus network, and anticipated new O&M costs for BRT operations, with the anticipated net change in O&M costs. None of the cost estimates assume additional O&M costs that may be incurred with relocating a Transfer Point. Those costs could include additional bus operations costs associated with route alignment adjustments to the new Transfer Point and/or additional facility maintenance costs.

Costs presented in Tables 3 through 7 assume BRT service in individual corridors. Costs for all four corridors operating as a system are slightly less than the cumulative costs presented in Tables 3 through 7, for there are BRT stations and TVMs in the central area that are common to two or more corridors. Tables 8 and 9 present *system* O&M cost estimates (Table 8 presents system costs when assuming a West Corridor Mineral Point Road alignment and Table 9 with a West Corridor Odana Road alignment).

Table 1
BRT Operating Statistics by Corridor

Individual Corridors

			One-Way			Service Frequency				Daily Rev.		Annual Rev.		Bus Requirements			
Corridor	From	To	Time (min)	Dist (mi)	Day	AM	Mid	PM	Eve	Bus-Mi's	Bus-Hrs	Bus-Miles	Bus-Hrs	AM	Mid	PM	Eve
East	East Towne	Capital Square	25.65	6.28	M-F	10	15	10	30	929	74	237,000	18,900	6.0	4.0	6.0	2.0
					Sat	30	15	15	30	653	52	34,000	2,700	2.0	4.0	4.0	2.0
					Sun	30	30	30	30	402	32	23,300	1,900	2.0	2.0	2.0	2.0
Totals for East Corridor												**294,300**	**23,500**	**6.0**	**4.0**	**6.0**	**2.0**
South	Caddis Bend	Capital Square	29.32	5.50	M-F	10	15	10	30	814	93	207,600	23,700	7.0	5.0	7.0	3.0
					Sat	30	15	15	30	572	68	29,700	3,500	3.0	5.0	5.0	3.0
					Sun	30	30	30	30	352	48	20,400	2,800	3.0	3.0	3.0	3.0
Totals for South Corridor												**257,700**	**30,000**	**7.0**	**5.0**	**7.0**	**3.0**
North	Warner Park/ Airport	Capital Square	24.58	5.91	M-F	20	30	20	60	437	37	111,500	9,400	3.0	2.0	3.0	1.0
					Sat	60	30	30	60	307	26	16,000	1,400	1.0	2.0	2.0	1.0
					Sun	60	60	60	60	189	16	11,000	900	1.0	1.0	1.0	1.0
	Warner Park/ Troy Drive	Capital Square	26.98	6.51	M-F	20	30	20	60	482	37	122,800	9,400	3.0	2.0	3.0	1.0
					Sat	60	30	30	60	339	26	17,600	1,400	1.0	2.0	2.0	1.0
					Sun	60	60	60	60	208	16	12,100	900	1.0	1.0	1.0	1.0
Totals for North Corridor												**291,000**	**23,400**	**6.0**	**4.0**	**6.0**	**2.0**
West Min. Pt. Option	High Point	Capital Square	36.43	7.76	M-F	10	15	10	30	1,148	111	292,900	28,300	9.0	6.0	9.0	3.0
					Sat	30	15	15	30	807	78	42,000	4,100	3.0	6.0	6.0	3.0
					Sun	30	30	30	30	497	48	28,800	2,800	3.0	3.0	3.0	3.0
Totals for West Corridor - Min Pt. Rd. Alignment												**363,700**	**35,200**	**9.0**	**6.0**	**9.0**	**3.0**
West Odana Rd. Option	High Point	Capital Square	39.43	8.61	M-F	10	15	10	30	1,274	111	324,900	28,300	9.0	6.0	9.0	3.0
					Sat	30	15	15	30	895	78	46,600	4,100	3.0	6.0	6.0	3.0
					Sun	30	30	30	30	551	48	32,000	2,800	3.0	3.0	3.0	3.0
Totals for West Corridor - Odana Rd. Alignment												**403,500**	**35,200**	**9.0**	**6.0**	**9.0**	**3.0**

Table 2
Estimated Change in Background Operating Statistics by Corridor

Corridor	Day	Change in Rev. Miles	Change in Rev. Hrs.	Change in Peak Buses
East	Wkdy	-505.9	-33.9	-1
	Sat	-43.3	-0.8	n/a
	Sun	-38.5	-0.5	n/a
	Annual	-133,481	-8,724	-1
North	Wkdy	-471.5	-33.6	-6
	Sat	-128.3	-8.7	n/a
	Sun	-120.7	-8.2	n/a
	Annual	-133,901	-9,482	-6
South	Wkdy	-321.7	-28.5	-3
	Sat	-112.2	-11.0	n/a
	Sun	-108.8	-10.7	n/a
	Annual	-94,168	-8,469	-3
West (Odana Road Alignment)	Wkdy	-442.1	-34.6	-5
	Sat	-97.6	-7.3	n/a
	Sun	-91.5	-6.9	n/a
	Annual	-123,118	-9,609	-5
West (Mineral Road Alignment)	Wkdy	-451.9	-35.5	-5.0
	Sat	-104.2	-7.9	n/a
	Sun	-97.7	-7.4	n/a
	Annual	-126,320	-9,876	-5
Total	Wkdy	-1,741.1	-130.7	-15
	Sat	-381.4	-27.8	n/a
	Sun	-359.5	-26.2	n/a
	Annual	-484,669	-36,284	-15

Table 3
East Corridor O&M Cost Estimates

O&M Costs for Background Bus Service Changes

Cost Item	Type of Unit	Units	Unit Cost	Cost Estimate
Vehicle Operations-Related Costs	Ann. Rev. Bus-Hrs.	-8,724	$75.61	-$659,642
Vehicle Maint.-Related Costs	Ann. Rev. Bus-Mi's.	-133,481	$1.39	-$185,044
Non-Veh. Maint. & G&A Costs	% of Above Items		18.07%	-$152,651
Total Change in O&M Costs (2011$)				-$997,338
Total Change in O&M Costs (2012$)			**1.021**	**-$1,018,282**
Cost per Rev. Bus-Hr.				*$116.72*

O&M Costs for BRT Service

Cost Item	Type of Unit	Units	Unit Cost	Cost Estimate
Vehicle Operations-Related Costs	BRT Rev. Bus-Hrs.	23,500	$75.61	$1,776,890
Vehicle Maint.-Related Costs	BRT Rev. Bus-Mi's.	294,300	$1.39	$407,988
Non-Veh. Maint. & G&A Costs	% of Above Items		18.07%	$394,850
Articulated Bus Premium	BRT Rev. Bus-Mi's.	294,300	$0.35	$101,997
TVM Maintenance	TVM Machines	13	$6,500	$84,500
Station/Stop Maintenance	Directional BRT Stop	29	$2,000	$58,000
Police/Fare Enforcement	BRT Rev. Bus-Hrs.	23,500	$6.38	$149,930
Total Change in O&M Costs (2011$)				$2,974,155
Total Change in O&M Costs (2012$)			1.021	**$3,036,612**
Cost per Rev. Bus-Hr.				*$129.22*

TOTAL O&M COST IMPACT FOR EAST CORRIDOR	**$2,018,330**

Table 4
North Corridor O&M Cost Estimates

O&M Costs for Background Bus Service Changes

Cost Item	Type of Unit	Units	Unit Cost	Cost Estimate
Vehicle Operations-Related Costs	Ann. Rev. Bus-Hrs.	-9,482	$75.61	-$716,956
Vehicle Maint.-Related Costs	Ann. Rev. Bus-Mi's.	-133,901	$1.39	-$185,627
Non-Veh. Maint. & G&A Costs	% of Above Items		18.07%	-$163,114
Total Change in O&M Costs (2011$)				-$1,065,697
Total Change in O&M Costs (2012$)			1.021	**-$1,088,077**
Cost per Rev. Bus-Hr.				*$114.75*

O&M Costs for BRT Service

Cost Item	Type of Unit	Units	Unit Cost	Cost Estimate
Vehicle Operations-Related Costs	BRT Rev. Bus-Hrs.	23,400	$75.61	$1,769,329
Vehicle Maint.-Related Costs	BRT Rev. Bus-Mi's.	291,000	$1.39	$403,413
Non-Veh. Maint. & G&A Costs	% of Above Items		18.07%	$392,657
Articulated Bus Premium	BRT Rev. Bus-Mi's.	291,000	$0.35	$100,853
TVM Maintenance	TVM Machines	12	$6,500	$78,000
Station/Stop Maintenance	Directional BRT Stop	20	$2,000	$40,000
Police/Fare Enforcement	BRT Rev. Bus-Hrs.	23,400	$6.38	$149,292
Total Change in O&M Costs (2011$)				$2,933,544
Total Change in O&M Costs (2012$)			1.021	**$2,995,148**
Cost per Rev. Bus-Hr.				*$128.00*

TOTAL O&M COST IMPACT FOR NORTH CORRIDOR	**$1,907,071**

Table 5
South Corridor O&M Cost Estimates

O&M Costs for Background Bus Service Changes

Cost Item	Type of Unit	Units	Unit Cost	Cost Estimate
Vehicle Operations-Related Costs	Ann. Rev. Bus-Hrs.	-8,469	$75.61	-$640,361
Vehicle Maint.-Related Costs	Ann. Rev. Bus-Mi's.	-94,168	$1.39	-$130,545
Non-Veh. Maint. & G&A Costs	% of Above Items		18.07%	-$139,318
Total Change in O&M Costs (2011$)				-$910,224
Total Change in O&M Costs (2012$)			1.021	**-$929,338**
Cost per Rev. Bus-Hr.				*$109.73*

O&M Costs for BRT Service

Cost Item	Type of Unit	Units	Unit Cost	Cost Estimate
Vehicle Operations-Related Costs	BRT Rev. Bus-Hrs.	30,000	$75.61	$2,268,370
Vehicle Maint.-Related Costs	BRT Rev. Bus-Mi's.	257,700	$1.39	$357,249
Non-Veh. Maint. & G&A Costs	% of Above Items		18.07%	$474,501
Articulated Bus Premium	BRT Rev. Bus-Mi's.	257,700	$0.35	$89,312
TVM Maintenance	TVM Machines	10	$6,500	$65,000
Station/Stop Maintenance	Directional BRT Stop	31	$2,000	$62,000
Police/Fare Enforcement	BRT Rev. Bus-Hrs.	30,000	$6.38	$191,400
Total Change in O&M Costs (2011$)				$3,507,832
Total Change in O&M Costs (2012$)			1.021	**$3,581,497**
Cost per Rev. Bus-Hr.				*$119.38*

TOTAL O&M COST IMPACT FOR SOUTH CORRIDOR	**$2,652,158**

Table 6
West Corridor: Mineral Pt. Rd. O&M Cost Estimates

O&M Costs for Background Bus Service Changes

Cost Item	Type of Unit	Units	Unit Cost	Cost Estimate
Vehicle Operations-Related Costs	Ann. Rev. Bus-Hrs.	-9,876	$75.61	-$746,747
Vehicle Maint.-Related Costs	Ann. Rev. Bus-Mi's.	-126,320	$1.39	-$175,117
Non-Veh. Maint. & G&A Costs	% of Above Items		18.07%	-$166,599
Total Change in O&M Costs (2011$)				-$1,088,464
Total Change in O&M Costs (2012$)			1.021	**-$1,111,321**
Cost per Rev. Bus-Hr.				*$112.53*

O&M Costs for BRT Service

Cost Item	Type of Unit	Units	Unit Cost	Cost Estimate
Vehicle Operations-Related Costs	BRT Rev. Bus-Hrs.	35,200	$75.61	$2,661,554
Vehicle Maint.-Related Costs	BRT Rev. Bus-Mi's.	363,700	$1.39	$504,197
Non-Veh. Maint. & G&A Costs	% of Above Items		18.07%	$572,113
Articulated Bus Premium	BRT Rev. Bus-Mi's.	363,700	$0.35	$126,049
TVM Maintenance	TVM Machines	21	$6,500	$136,500
Station/Stop Maintenance	Directional BRT Stop	33	$2,000	$66,000
Police/Fare Enforcement	BRT Rev. Bus-Hrs.	35,200	$6.38	$224,576
Total Change in O&M Costs (2011$)				$4,290,989
Total Change in O&M Costs (2012$)			1.021	**$4,381,100**
Cost per Rev. Bus-Hr.				*$124.46*

TOTAL O&M COST IMPACT FOR WEST CORRIDOR: Min. Pt. Road Option	**$3,269,779**

Table 7
West Corridor: Odana Rd. O&M Cost Estimates

O&M Costs for Background Bus Service Changes

Cost Item	Type of Unit	Units	Unit Cost	Cost Estimate
Vehicle Operations-Related Costs	Ann. Rev. Bus-Hrs.	-9,609	$75.61	-$726,559
Vehicle Maint.-Related Costs	Ann. Rev. Bus-Mi's.	-123,118	$1.39	-$170,678
Non-Veh. Maint. & G&A Costs	% of Above Items		18.07%	-$162,148
Total Change in O&M Costs (2011$)				-$1,059,386
Total Change in O&M Costs (2012$)			1.021	**-$1,081,633**
Cost per Rev. Bus-Hr.				*$112.56*

O&M Costs for BRT Service

Cost Item	Type of Unit	Units	Unit Cost	Cost Estimate
Vehicle Operations-Related Costs	BRT Rev. Bus-Hrs.	35,200	$75.61	$2,661,554
Vehicle Maint.-Related Costs	BRT Rev. Bus-Mi's.	403,500	$1.39	$559,371
Non-Veh. Maint. & G&A Costs	% of Above Items		18.07%	$582,085
Articulated Bus Premium	BRT Rev. Bus-Mi's.	403,500	$0.35	$139,843
TVM Maintenance	TVM Machines	23	$6,500	$149,500
Station/Stop Maintenance	Directional BRT Stop	37	$2,000	$74,000
Police/Fare Enforcement	BRT Rev. Bus-Hrs.	35,200	$6.38	$224,576
Total Change in O&M Costs (2011$)				$4,390,929
Total Change in O&M Costs (2012$)			1.021	**$4,483,138**
Cost per Rev. Bus-Hr.				*$127.36*

TOTAL O&M COST IMPACT FOR WEST CORRIDOR: Odana Rd. Option $3,401,506

Table 8
System O&M Cost Estimates: With Mineral Pt. Road Alignment Option

O&M Costs for Background Bus Service Changes

Cost Item	Type of Unit	Units	Unit Cost	Cost Estimate
Vehicle Operations-Related Costs	Ann. Rev. Bus-Hrs.	-36,551	$75.61	-$2,763,706
Vehicle Maint.-Related Costs	Ann. Rev. Bus-Mi's.	-487,870	$1.39	-$676,333
Non-Veh. Maint. & G&A Costs	% of Above Items		18.07%	-$621,683
Total Change in O&M Costs (2011$)				-$4,061,722
Total Change in O&M Costs (2012$)			1.021	**-$4,147,019**
Cost per Rev. Bus-Hr.				*$113.46*

O&M Costs for BRT Service

Cost Item	Type of Unit	Units	Unit Cost	Cost Estimate
Vehicle Operations-Related Costs	BRT Rev. Bus-Hrs.	112,000	$75.61	$8,468,581
Vehicle Maint.-Related Costs	BRT Rev. Bus-Mi's.	1,206,700	$1.39	$1,672,846
Non-Veh. Maint. & G&A Costs	% of Above Items		18.07%	$1,832,755
Articulated Bus Premium	BRT Rev. Bus-Mi's.	1,206,700	$0.35	$418,211
TVM Maintenance	TVM Machines	41	$6,500	$266,500
Station/Stop Maintenance	Directional BRT Stop	93	$2,000	$186,000
Police/Fare Enforcement	BRT Rev. Bus-Hrs.	112,000	$6.38	$714,560
Total Change in O&M Costs (2011$)				$13,559,454
Total Change in O&M Costs (2012$)			1.021	**$13,844,203**
Cost per Rev. Bus-Hr.				*$123.61*

TOTAL O&M COST IMPACT FOR SOUTH CORRIDOR $9,697,184

Table 9
System O&M Cost Estimates: With Odana Road Alignment Option

O&M Costs for Background Bus Service Changes

Cost Item	Type of Unit	Units	Unit Cost	Cost Estimate
Vehicle Operations-Related Costs	Ann. Rev. Bus-Hrs.	-36,284	$75.61	-$2,743,518
Vehicle Maint.-Related Costs	Ann. Rev. Bus-Mi's.	-484,668	$1.39	-$671,894
Non-Veh. Maint. & G&A Costs	% of Above Items		18.07%	-$617,232
Total Change in O&M Costs (2011$)				-$4,032,644
Total Change in O&M Costs (2012$)			1.021	**-$4,117,330**
Cost per Rev. Bus-Hr.				*$113.48*

O&M Costs for BRT Service

Cost Item	Type of Unit	Units	Unit Cost	Cost Estimate
Vehicle Operations-Related Costs	BRT Rev. Bus-Hrs.	112,000	$75.61	$8,468,581
Vehicle Maint.-Related Costs	BRT Rev. Bus-Mi's.	1,246,500	$1.39	$1,728,021
Non-Veh. Maint. & G&A Costs	% of Above Items		18.07%	$1,842,727
Articulated Bus Premium	BRT Rev. Bus-Mi's.	1,246,500	$0.35	$432,005
TVM Maintenance	TVM Machines	43	$6,500	$279,500
Station/Stop Maintenance	Directional BRT Stop	97	$2,000	$194,000
Police/Fare Enforcement	BRT Rev. Bus-Hrs.	112,000	$6.38	$714,560
Total Change in O&M Costs (2011$)				$13,659,394
Total Change in O&M Costs (2012$)			1.021	**$13,946,241**
Cost per Rev. Bus-Hr.				*$124.52*

TOTAL O&M COST IMPACT FOR SOUTH CORRIDOR	**$9,828,911**

APPENDIX A
ESTIMATED CHANGE IN BUS STATISTICS FOR BACKGROUND BUS ROUTES

Corridor	Route	Route Change	Day	Change in Rev. Miles	Change in Rev. Hrs.	Change in Peak Buses
East	6	Eliminate service between Cap. Sq. and East Towne Mall	Wkdy	-790.0	-56.7	-5
			Sat	-238.0	-17.0	n/a
			Sun	-224.0	-16.0	n/a
			Annual	-226,818	-16,262	-5
	13	Realign route to East Washington Ave. & Milwaukee Street	Wkdy	135.0	11.3	2
			Sat	86.4	7.2	n/a
			Sun	81.0	6.8	n/a
			Annual	43,616	3,635	2
	20	Eliminate airport service and add Kinsman/Bartilo and Portege/Hayes service	Wkdy	123.5	10.3	1
			Sat	108.3	9.0	n/a
			Sun	104.5	8.7	n/a
			Annual	43,185	3,599	1
	25	Eliminate route	Wkdy	-46.0	-2.9	0
			Sat	0.0	0.0	n/a
			Sun	0.0	0.0	n/a
			Annual	-11,730	-742	0
	26	Add peak period service Increase peak period headways	Wkdy	71.6	4.1	1
			Sat	0.0	0.0	n/a
			Sun	0.0	0.0	n/a
			Annual	18,266	1,047	1
	34	Minor route alignment to provide service on East Washington Ave.	No significant change in statistics			
North	22	Eliminate route	Wkdy	-339.6	-23.0	-2
			Sat	-128.3	-8.7	n/a
			Sun	-120.7	-8.2	n/a
			Annual	-100,267	-6,794	-2
	27	Eliminate route	Wkdy	-85.1	-7.4	-2
			Sat	0.0	0.0	n/a
			Sun	0.0	0.0	n/a
			Annual	-21,708	-1,882	-2
	29	Eliminate route	Wkdy	-46.8	-3.2	-2
			Sat	0.0	0.0	n/a
			Sun	0.0	0.0	n/a
			Annual	-11,926	-806	-2

Corridor	Route	Route Change	Day	Change in Rev. Miles	Change in Rev. Hrs.	Change in Peak Buses
South	5	Eliminate service between Cap. Sq. and South Transfer Point	Wkdy	-217.6	-21.3	-1
			Sat	-112.2	-11.0	n/a
			Sun	-108.8	-10.7	n/a
			Annual	-67,633	-6,631	-1
	44/48	Turn back route at Caddis Bend	Wkdy	-104.1	-7.2	-2
			Sat	0.0	0.0	n/a
			Sun	0.0	0.0	n/a
			Annual	-26,535	-1,839	-2
	47	Minor route alignment to Mills Street		No significant change in statistics		
West	2	Eliminate supplemental a.m. trips on West Side	Wkdy	-36.4	-3.3	-2
			Sat	0.0	0.0	n/a
			Sun	0.0	0.0	n/a
			Annual	-9,282	-833	-2
	14	Minor route alignment change in Hill Farms area		No significant change in statistics		
	37	Eliminate service west of UW Campus (3 trips)	Wkdy	-5.7	-0.4	0
			Sat	0.0	0.0	n/a
			Sun	0.0	0.0	n/a
			Annual	-1,454	-102	0
	67	Eliminate route	Wkdy	-299.6	-22.6	-2
			Sat	-104.2	-7.9	n/a
			Sun	-97.7	-7.4	n/a
			Annual	-87,483	-6,599	-2
	70	Turn back route at Hill Farms	Wkdy	-110.2	-9.2	-1
			Sat	0.0	0.0	n/a
			Sun	0.0	0.0	n/a
			Annual	-28,101	-2,342	-1
	73/63	Realign to Mineral Point Road (Odana Road alignment option only)	Wkdy	9.8	0.8	0
			Sat	6.6	0.6	n/a
			Sun	6.2	0.5	n/a
			Annual	3,202	267	0

BRT CORRIDOR STUDY
~~10.29.12~~
2.18.13

INFILL AND REDEVELOPMENT ASSESMENT

DRAFT

An evaluation of the potential for infill and redevelopment along the four corridors being studied for future Bus Rapid Transit (BRT)

This project was created as part of the Capital Region Sustainable Communities Consortium, a group initiated as part of the Sustainable Communities Grant, from the U.S. Department of Housing and Urban Development received by the Capital Area Regional Planning Commission.

Project Team

The project team was assembled to create, review and suggest improvements to the methods and products of this report. The team was comprised of:

- Dan McAuliffe, Planner/Urban Designer, CARPC (project lead)
- Steve Steinhoff, Senior Community Planner, CARPC
- Brian Grady, Planner, City of Madison
- Todd Violante, Director, Dane County Planning and Development
- Curt Kodl, Planner, Dane County

For more information, please contact Dan McAuliffe

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Executive Summary

The infill and redevelopment assessment was undertaken to gain a better understanding of the development potential along Bus Rapid Transit (BRT) corridors currently being considered for future development. BRT is high-frequency, limited-stop bus system that offers faster service and improved urban mobility, often featuring dedicated lanes, traffic signal priority, distinct busses and stations, and real-time information systems that provides users with current wait time. BRT is most appropriate for the highest ridership areas within a larger bus system and can be developed at less than half the cost of rail. The findings of this document will be used by the BRT transit and market study consultants to provide them a better understanding of the opportunities that exist along the corridors being studied. It also can provide information about future population and employment that could occur in these areas, which can be used when deciding the level of BRT service that is most appropriate. The four corridors being studied for future BRT start from the Capitol square and travel as follows:

- East: Following East Washington Avenue to East Towne Mall with a slight deviation to service Madison College (MATC) near Hwy 51.
- West: Traveling on University Avenue to Whitney Way, then to West Towne Mall via Mineral Point or Odana Road.
- North: Traveling to Warner park via Fordem and Sherman.
- South: Via Park Street, transitioning to Fish Hatchery on Badger Road, and terminating at Hatchery Hill.

The process used for the infill and redevelopment assessment identified sites, established development programs for each site and summarized the data by corridor. Infill and redevelopment sites were identified using several metrics addressing value, building size and others combined with a visual inspection of the corridors. Based on conditions on the sites, they were classified by the estimated timeframe of their potential redevelopment, recognizing that certain sites will likely develop sooner than others. Next, each site was assigned a detailed building program (based on existing plans when available) or a building type suitable to the site's context.

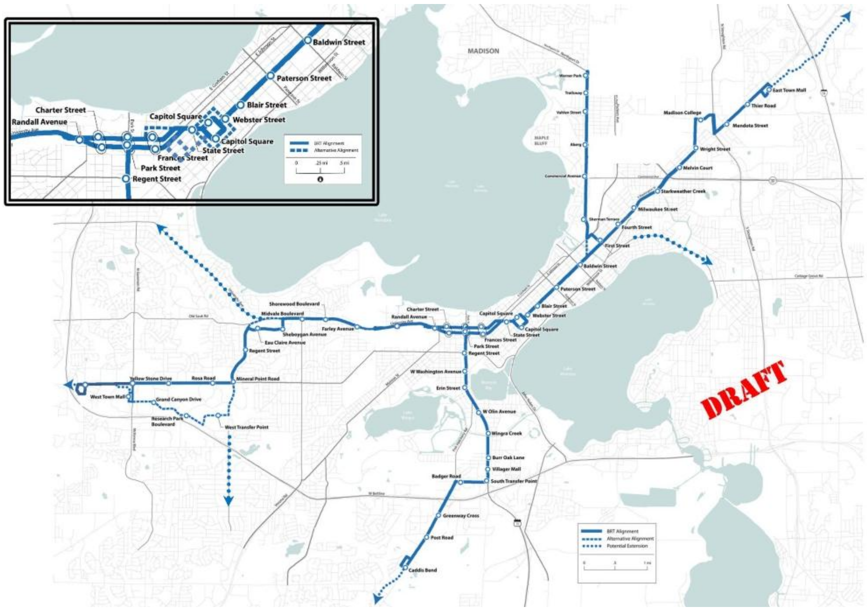


Figure A: Map of Potential BRT Corridors

Overall, approximately 160 redevelopment sites were identified in the corridors, often comprising multiple parcels. The East Washington corridor had the largest number of sites, 48, with a combined 240 acres, including the 100 acre East Towne site of the mall and surrounding properties. This was followed by the western corridor, which has 27 sites but greater acreage (300 acres), largely due to the 80 acre West Town site and the vacant 60 acre CUNA Mutual property between Mineral Point and Odana Roads. The South and North corridors are characterized by small sites, with the exception of those found in those in and around the Wingra Triangle area.

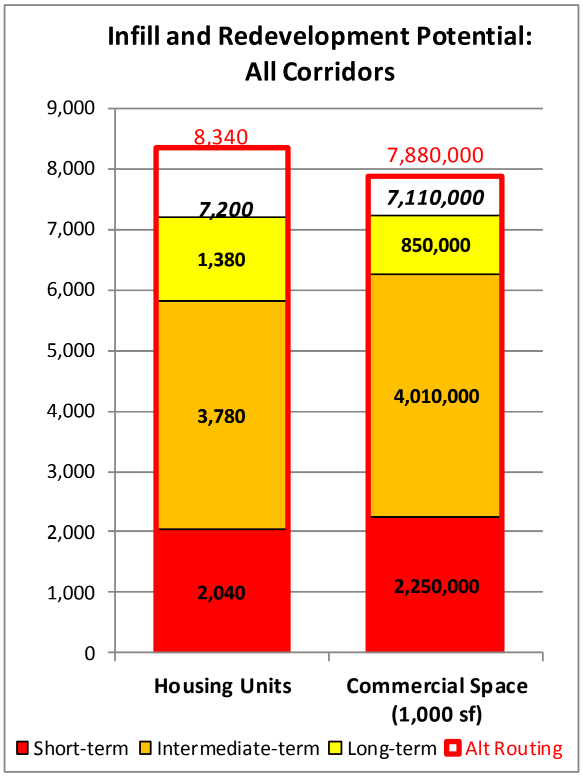


Figure B: Summary of infill and redevelopment, all corridors

Overall, the sites along the primary routing identified have the potential for approximately 7,200 housing units and over 7,000,000 square feet of commercial space. Due to the context of these sites, townhomes and multifamily units comprise all of the residential units discussed, though no distinction was made between rental and owner-occupied housing. Put in perspective, the City of Madison added an average of about 1,600 housing units a year from 2000-2010, with slightly more than half in multi-family buildings. With regards to commercial space, the greater Madison area absorbed an average of about 260,000 square feet of office space a year during that period. Total retail inventory in the area is about 40.6 million square feet.

When alternative routing is used on the West corridor, these numbers increase by about 15%. Approximately 85% of the identified infill/redevelopment potential was thought to be on a site that could intensify in either the short (0-10 years) or intermediate-term (11-20 years).

When evaluated by corridor, the East Washington corridor contains the most redevelopment potential for residential and commercial space, which is not surprising given the corridor had the most area in redevelopment sites and some of the highest density building programs of the corridors. It is followed by the West corridor, particularly the alternative routing on Odana Road. The south approaches the west corridor in terms of residential and falls short in commercial development. The north corridor, with the fewest and frequently small sites, had the lowest redevelopment and infill potential.

While it is recognized not all development would likely occur, the potential value and occupancy capacity of these sites is significant. The 160 sites conservatively have value capacity of over $2.6 billion dollars and could support a new population of nearly 45,000 (including residents, employees and customers).

Infill and Redevelopment Potential	Value	New Population (residents, employees, customers)
East Corridor	$1,245,000,000	18,970
North Corridor	$125,000,000	1,980
West Corridor	$620,000,000	10,510
West Corridor Alt Route	*$285,000,000*	*5,680*
South Corridor	$365,000,000	6,550
Total	**$2,640,000,000**	**43,690**

Figure C: Value of Redevelopment

This estimate of redevelopment potential does not include East Towne and West Towne mall areas. Given the very large size of the areas, both over 80 acres, the wide range of possible redevelopment scenarios and unpredictable market forces, assigning specific redevelopment estimates is problematic. Using successful mall redevelopments as guides for estimating development capacity, it is conceivable that the two mall areas combined could redevelop to add between 800,000 and 1,350,000 square feet of commercial and between 1,100 and 2,200 residential units. At the high end, this amounts to approximately 20% of the total estimated redevelopment potential.

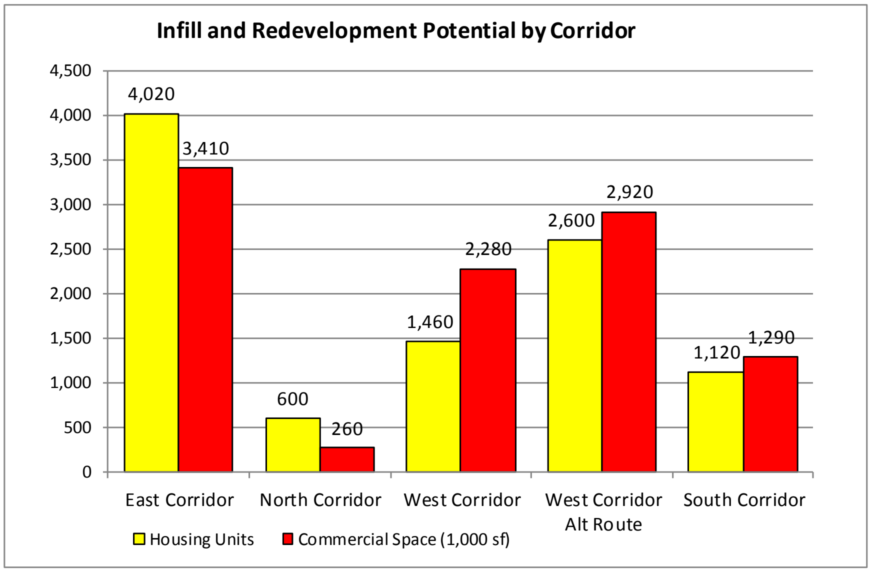


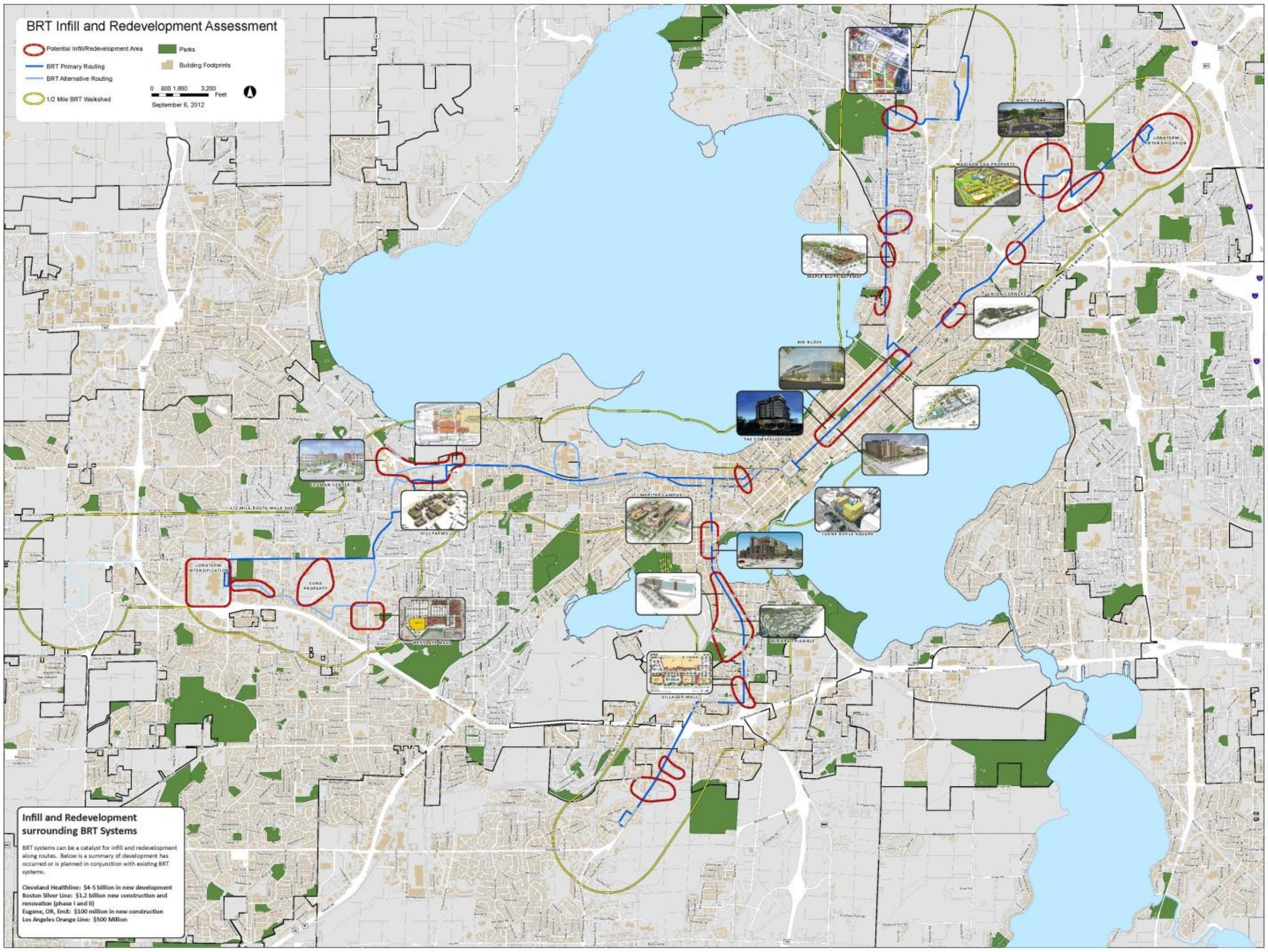
Figure D: Summary of infill and redevelopment, by corridors

One theme that arose through this process was that redevelopment is often unpredictable, sometime happening in unforeseen areas and not in areas thought to prime for redevelopment. With that mentioned, certain areas appear to be on the cusp of rapid redevelopment. The East Washington corridor between the Capitol and First Street can be classified as one of those areas. With the Constellation (700 block) currently under construction, interest in the Reynolds properties (700 block of Mifflin) and the potential for the City of Madison to sell the city-owned 800 block, this area could be transformed very quickly. Other major sites that could redevelop on this corridor include the collection of properties owned by the Mullins Group next to the Yahara River. BRT could help further encourage development in this area, especially since location (and all those between First Street and Park Street) would be served by two of the corridors, resulting in higher volume of riders and direct transit access to more areas. Other areas appearing to be likely for catalytic redevelopment include Park Street between Monona Bay and the Wingra Triangle, and the concentration of parcels surrounding University Avenue and Whitney Way.

Figure E: Major infill and redevelopment areas.

Site	Corridor	Size	Description
800 E Wash	East	4.5 acres	The site was the focus of an RFP, which was awarded to ULI, who proposed 160,000 sf of commercial and 85 residential units. That proposal fell through, but an unsolicited proposal by Metcalfe's emerged during the process. The Metcalfe's proposed 90,000 sf of commercial including a grocery store and office space, a 120 room hotel and 14 townhomes. The city may reissue the rfp, negotiate with another developer, or put the land up for sale.
Union Corners	East	12.5 acres	Two RFP responses are currently under consideration by the City. The proposals generally include around 160 residential units and 160,000 square feet of commercial space.
1400 E Wash	East	14 acres	A collection of several parcels, all owned by the Mullins Group on the west side of the Yahara River. While many of the sites have buildings on them, they are generally underutilized and could house additional space. Using a mix of building types, the site could support nearly 600 dwelling units and 450,000 square feet of commercial space.
Hill Farms	West	21 acres	Owned by the state, the site was once planned to be sold and use the proceeds to construct a replacement facility. The approved GDP calls for an intensification of 1.4 million square feet and 350 residential units.
CUNA UW	West	60 acres	Two vacant parcels owned by CUNA Mutual and the UW Research Park. If developed similarly to abutting office buildings and senior housing, it would have the capacity for over 500 housing units and 600,000 square feet of commercial space.
Westgate	West	18 acres	A new Hyvee is currently under development at the Westgate Mall. Additionally the shopping center's owner has created a redevelopment plan that calls for a total of 250,000 square feet of commercial and 186 residential unites
Wingra Triangle	South	32 acres	While currently under construction at the northern tip, the remainder of the site is planned for 125 residential units and 630,000 square feet of commercial and clinic space.
Thorstad Chevy	South	15 acres	The vacant car lot could support approximately 150 dwelling units and 120,000 square feet of commercial if programmed with a mixture of uses.

Figure F: Summary map of major infill and redevelopment areas.



Infill and Redevelopment surrounding BRT Systems

BRT systems can be a catalyst for infill and redevelopment along routes. Below is a summary of development has occurred or is planned in conjunction with existing BRT systems.

Cleveland Healthline: $4-5 billion in new development
Boston Silver Line: $1.2 billion new construction and renovation (phase I and II)
Eugene, OR, EmX: $100 million in new construction
Los Angeles Orange Line: $500 Million

Introduction

The infill and redevelopment assessment was conducted as one element of the Transit Corridor Studies undertaken by the Capital Region Sustainable Communities (CRSC) Consortium. Corridor studies include a Bus Rapid Transit (BRT) and express bus study ("transit study") managed by the Madison Area Transportation Planning Board (MATPB, the area's Metropolitan Planning Organization, or MPO). A market study will estimate demand for transit supportive housing and commercial along the proposed BRT corridors and express (commuter) bus destinations in outlying communities.

The purpose of the infll and redevelopment assessment is to gain a better understanding of physical development capacity that exists along the BRT corridors, by identifying the quantity, type and locations of potential future infill and redevelopment that could occur.

How the Findings will be Used

The infill and redevelopment assessment, transit, and market studies are inter-related and coordinated to integrate land use and transportation planning. The infill study estimates the development potential. The market study uses this development potential, along with other information, to estimate demand for housing and business space, coming from infill and redevelopment, upon start-up of BRT (estimated 2020-2022): Given trends and market conditions, what portion of the available infill and redevelopment areas are likely to develop in the next 10, 20 and 30 years? The transit study then uses this demand estimate as one of the factors generating ridership upon BRT start-up.

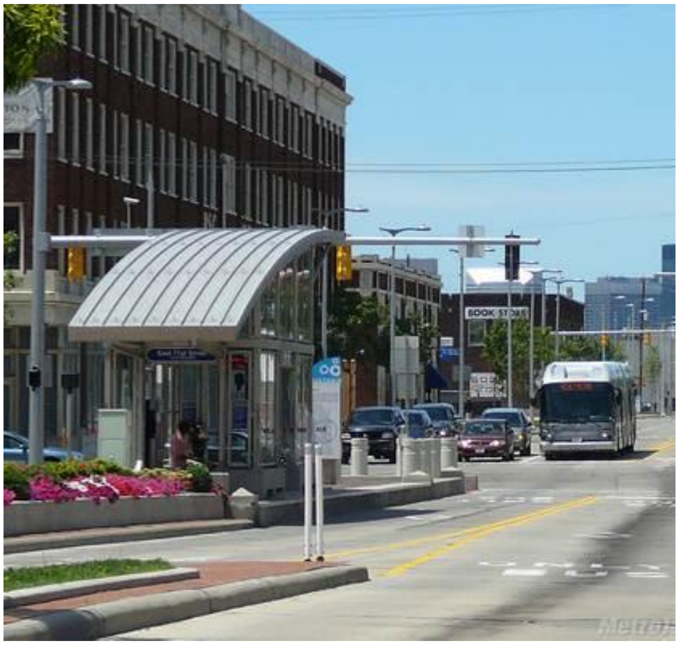


Figure 1: A BRT station in Cleveland

What is BRT?

Bus rapid transit (BRT) is high-frequency, limited-stop service that offers faster service and improved urban mobility. BRT has been described as a bus system that acts similarly to a light rail.

Compared to traditional bus service, BRT has the potential for faster service and increased ridership. For example, Eugene, Oregon's EmX service saw a 74% increase in ridership with a 30% increase in speed vs. previous bus service. BRT is best suited for routes that are heavily used by existing or future transit riders and is not a solution for every route.

One factor that makes BRT an especially attractive form of rapid transit is its significantly lower price compared to rail systems. While its difficult to directly compare costs due to location-specific requirements such as bridges, tunnels, right of way, etc., light rail transit systems cost between $40 and $50 million per mile. Commuter rail (which relies heavily on existing tracks for cost savings) ranges between $10 and $30 million per mile. In contrast, BRT systems can cost as little as $3 to $10 million per mile.

There are some key differences between traditional busses and BRT. Most notably, the frequency of trips is higher, typically with 15 minute or better service all day and 10 minute or better at peak times. The distance between stops is increased over typical bus routes. Traditional bus stop spacing is around 1/4 to 1/8 mile, with BRT stations are typically spaced about ½ mile apart.

Bus stops are often replaced with BRT stations, which are generally sheltered waiting areas with distinct architecture. These stations often feature off-board ticket purchase, which allow for faster passenger boarding, further reducing transit times. BRT stations frequently contain informational displays showing the status and anticipated wait time for the next bus. BRT vehicles are generally larger and of a distinct design to reinforce branding messages of rapid transit. BRT systems can also utilize dedicated lanes (busways) to speed transit times, though they can also function well in mixed traffic. Most BRTs have signal priority systems that can extend green lights or shorten red lights to allow the bus to proceed faster.

Once BRT is operational, it can stimulate additional demand for housing and business. Additional demand can result from growing ridership (customers), physical improvements (stations and dedicated travel lanes that convey permanence), and better access to jobs and activities from station areas. Public policies and development incentives also are important in stimulating transit supportive development (also called transit-oriented development).

Transit supportive development, in turn generates new transit riders, which, in turn can stimulate more development. Figure 2 below shows the mutually supporting relationship. The market study, with data from the infill study, will estimate additional demand, resulting from BRT, to 2035 for housing and jobs along the corridor.

The findings could also have some influence on route selection. While many of the initial routing decisions have previously been made, some important decisions remain and development potential along the corridor is one of five considerations. The remaining considerations are:

- Employment within ¼ or ½ mile
- Existing transit ridership along route
- Population within ¼ or ½ mile
- Roadway suitability.

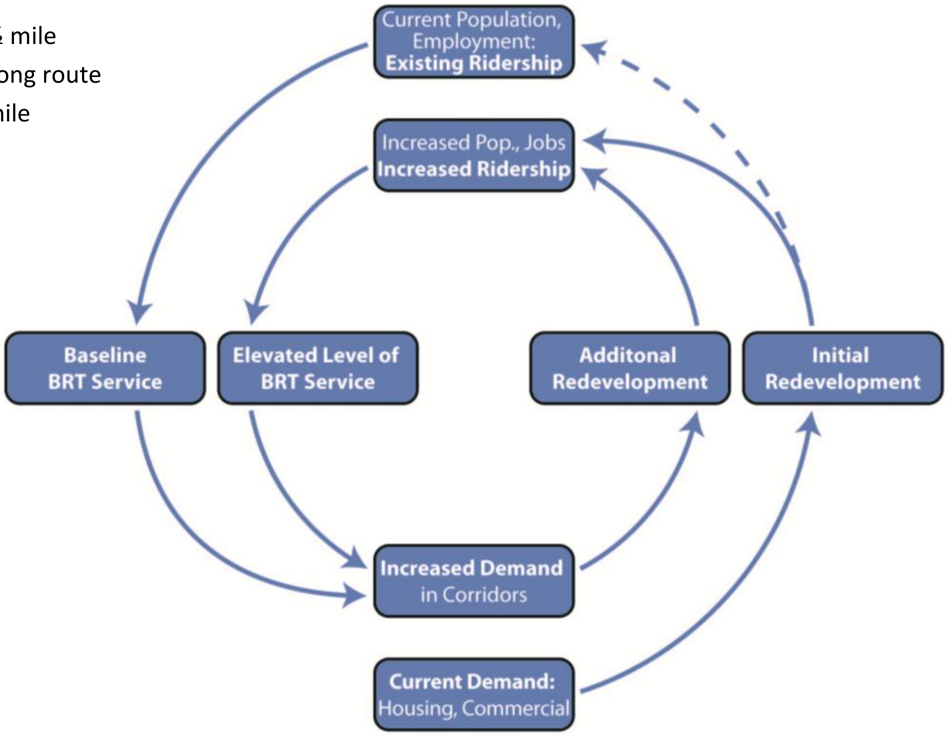

Current Population, Employment: Existing Ridership
Increased Pop., Jobs Increased Ridership
Baseline BRT Service
Elevated Level of BRT Service
Additonal Redevelopment
Initial Redevelopment
Increased Demand in Corridors
Current Demand: Housing, Commercial

Figure 2: Market demand and BRT potential relationship diagram

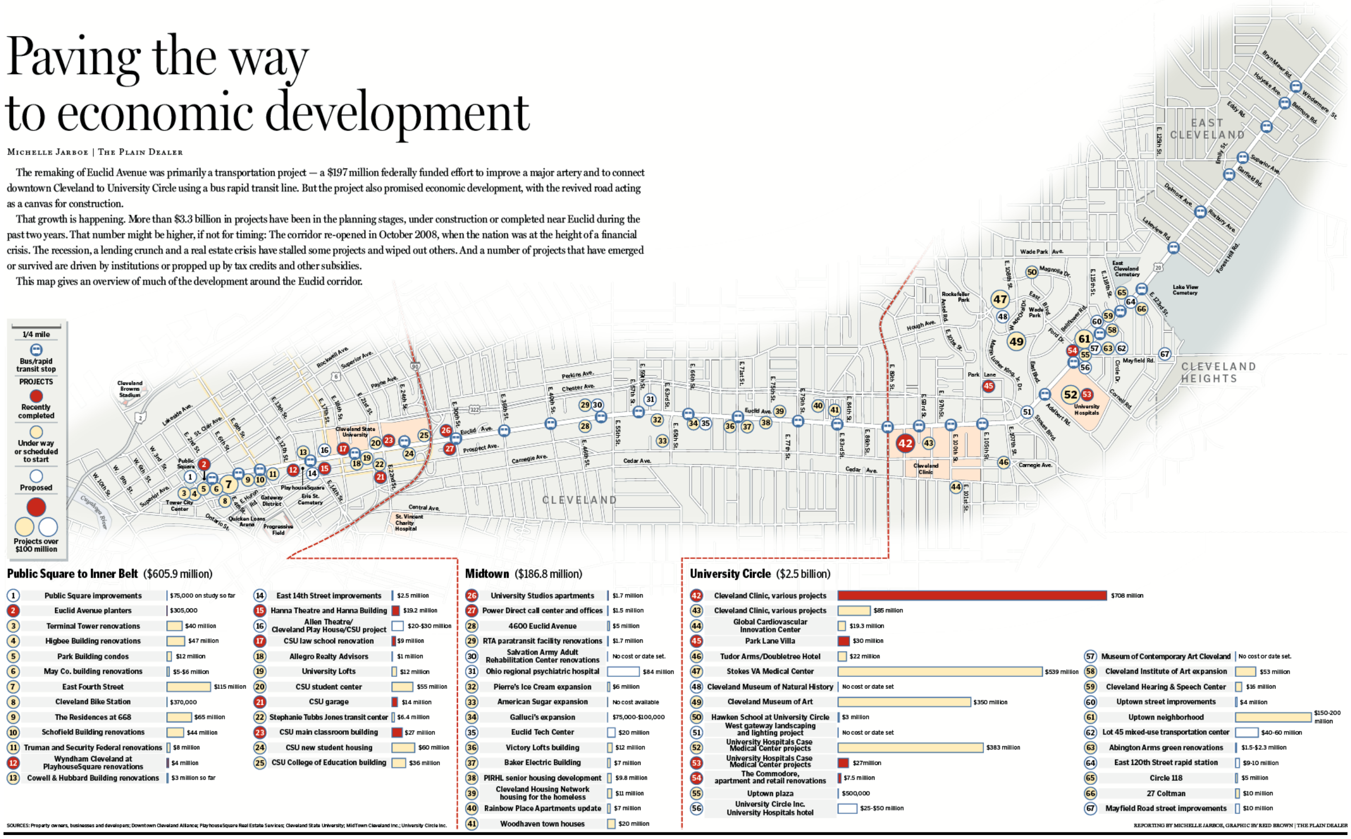
BRT and Economic Development Potential

While modern BRT is a relatively new method of mass transit, some systems have shown the ability of BRT to spur transit-oriented development along the routes. Cleveland's Healthline, which links the city's downtown and University Circle area, is regarded as one of the most successful systems in terms of economic impact, spurring development and leveraging investment in the surrounding corridors. Since the Healthline opened in 2008, over $4 billion in new development and redevelopment has occurred along the corridor. While much of this was institutional uses, including hospital and university facilities, the project is attributed for catalyzing the corridor and spurring housing and commercial development.

Similarly, in Boston over $700 million of development occurred in a 1.5 mile stretch along its Silverline with an equal amount planned. Los Angelis' Orange Line achieved ridership levels projected to take 15 years in seven months, yielding $500 million in developments surrounding station areas. Some BRT systems have not been as successful at creating development along the routes, however this may have as much to do with the timing as any other factor; several BRT systems were developed just before or in the years since the economic downturn of 2008. The lingering side effects of the recession may be limiting growth along these corridors; however the success of these systems is reflected in the increased ridership observed.

While the amount of infill and redevelopment that could occur along the potential BRT corridors in Madison is difficult to determine, this assessment provides some insight in to opportunities that exist. The picture will be further clarified by the market study, which will estimate market demand in these areas with and without the development of a BRT system.

Figure 3: Illustration showing investment and economic development surrounding Cleveland's Healthline



Paving the way
to economic development

Michelle Jarboe | The Plain Dealer

The remaking of Euclid Avenue was primarily a transportation project — a $197 million federally funded effort to improve a major artery and to connect downtown Cleveland to University Circle using a bus rapid transit line. But the project also promised economic development, with the revived road acting as a canvas for construction.

That growth is happening. More than $3.3 billion in projects have been in the planning stages, under construction or completed near Euclid during the past two years. That number might be higher, if not for timing: The corridor re-opened in October 2008, when the nation was at the height of a financial crisis. The recession, a lending crunch and a real estate crisis have stalled some projects and wiped out others. And a number of projects that have emerged or survived are driven by institutions or propped up by tax credits and other subsidies.

This map gives an overview of much of the development around the Euclid corridor.

Public Square to Inner Belt ($605.9 million)

1	Public Square improvements	$75,000 on study so far
2	Euclid Avenue planters	$305,000
3	Terminal Tower renovations	$40 million
4	Higbee Building renovations	$47 million
5	Park Building condos	$12 million
6	May Co. building renovations	$5-$6 million
7	East Fourth Street	$115 million
8	Cleveland Bike Station	$370,000
9	The Residences at 668	$65 million
10	Schofield Building renovations	$44 million
11	Truman and Security Federal renovations	$8 million
12	Wyndham Cleveland at PlayhouseSquare renovations	$4 million
13	Cowell & Hubbard Building renovations	$3 million so far
14	East 14th Street improvements	$2.5 million
15	Hanna Theatre and Hanna Building	$19.2 million
16	Allen Theatre/ Cleveland Play House/CSU project	$20-$30 million
17	CSU law school renovation	$9 million
18	Allegro Realty Advisors	$1 million
19	University Lofts	$12 million
20	CSU student center	$55 million
21	CSU garage	$14 million
22	Stephanie Tubbs Jones transit center	$6.4 million
23	CSU main classroom building	$27 million
24	CSU new student housing	$60 million
25	CSU College of Education building	$36 million

SOURCES: Property owners, businesses and developers; Downtown Cleveland Alliance; PlayhouseSquare Real Estate Services; Cleveland State University; MidTown Cleveland Inc.; University Circle Inc.

Midtown ($186.8 million)

26	University Studios apartments	$1.7 million
27	Power Direct call center and offices	$1.5 million
28	4600 Euclid Avenue	$5 million
29	RTA paratransit facility renovations	$1.7 million
30	Salvation Army Adult Rehabilitation Center renovations	No cost or date set.
31	Ohio regional psychiatric hospital	$84 million
32	Pierre's Ice Cream expansion	$6 million
33	American Sugar expansion	No cost available
34	Galluci's expansion	$75,000-$100,000
35	Euclid Tech Center	$20 million
36	Victory Lofts building	$12 million
37	Baker Electric Building	$7 million
38	PIRHL senior housing development	$9.8 million
39	Cleveland Housing Network housing for the homeless	$11 million
40	Rainbow Place Apartments update	$7 million
41	Woodhaven town houses	$20 million

University Circle ($2.5 billion)

42	Cleveland Clinic, various projects	$708 million
43	Cleveland Clinic, various projects	$85 million
44	Global Cardiovascular Innovation Center	$19.3 million
45	Park Lane Villa	$30 million
46	Tudor Arms/Doubletree Hotel	$22 million
47	Stokes VA Medical Center	$539 million
48	Cleveland Museum of Natural History	No cost or date set
49	Cleveland Museum of Art	$350 million
50	Hawken School at University Circle	$3 million
51	West gateway landscaping and lighting project	No cost or date set
52	University Hospitals Case Medical Center projects	$383 million
53	University Hospitals Case Medical Center projects	$27million
54	The Commodore, apartment and retail renovations	$7.5 million
55	Uptown plaza	$500,000
56	University Circle Inc. University Hospitals hotel	$25-$50 million
57	Museum of Contemporary Art Cleveland	No cost or date set.
58	Cleveland Institute of Art expansion	$53 million
59	Cleveland Hearing & Speech Center	$16 million
60	Uptown street improvements	$4 million
61	Uptown neighborhood	$150-200 million
62	Lot 45 mixed-use transportation center	$40-60 million
63	Abington Arms green renovations	$1.5-$2.3 million
64	East 120th Street rapid station	$9-10 million
65	Circle 118	$5 million
66	27 Coltman	$10 million
67	Mayfield Road street improvements	$10 million

REPORTING BY MICHELLE JARBOE, GRAPHIC BY REID BROWN | THE PLAIN DEALER

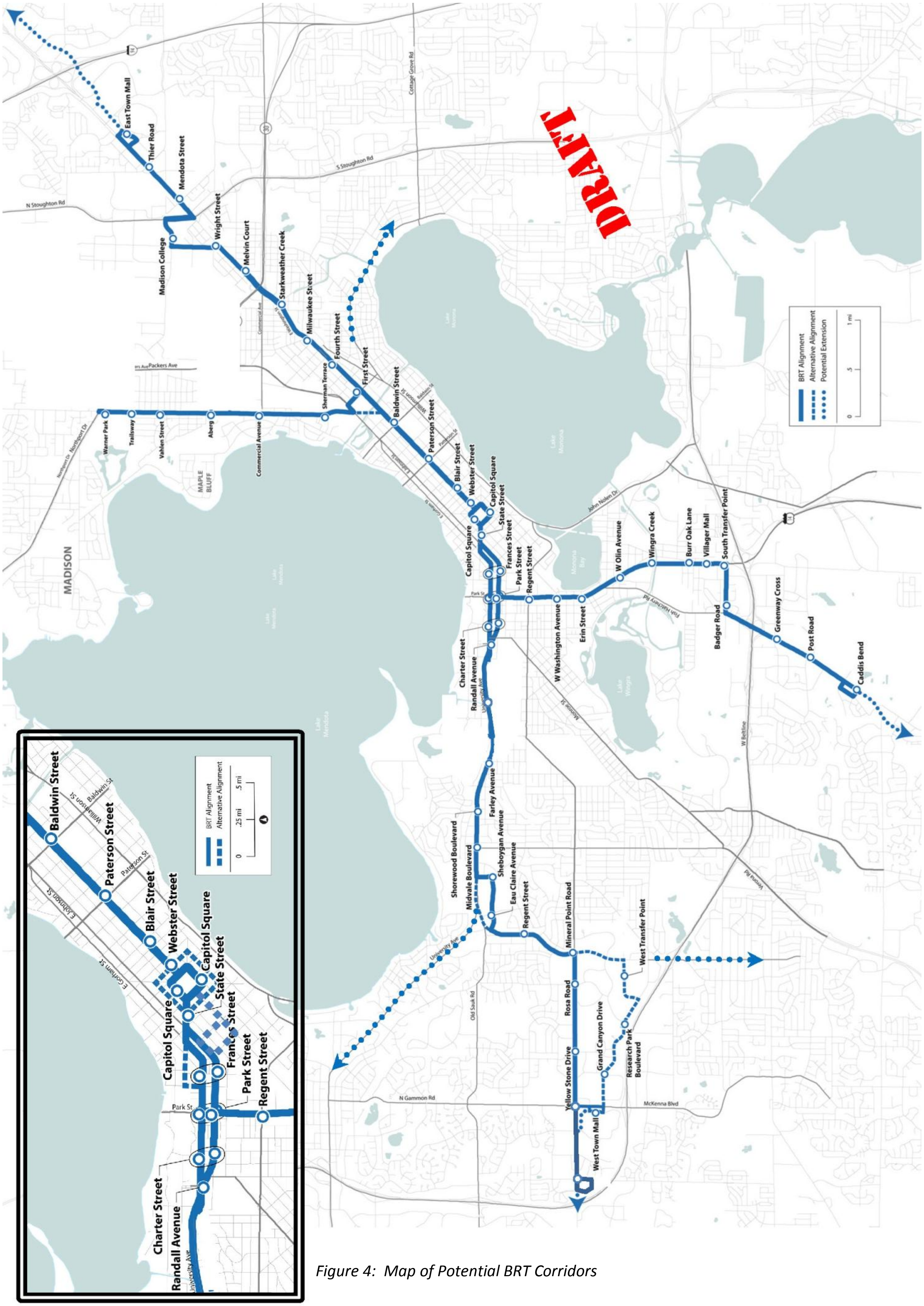


Figure 4: Map of Potential BRT Corridors

The BRT Corridors and Other Potential Future Transit Improvements

There are four primary corridors of study, emanating from the Capitol Square in Madison. The eastern route of study primarily follows East Washington Avenue, extending to East Towne Mall with a slight deviation at Hwy 51 to serve Madison College (MATC). A potential extension would continue east toward Sun Prairie via High Crossing Boulevard. The north corridor travels via Sherman Avenue to Warner Park and Northport Avenue. The western route follows University Avenue, transitioning to Mineral Point Road via Whitney Way. Routing alternatives include Odana Road from Whitney Way to West Towne Mall, and a there is a potential route extension to the planned University Research Park expansion west of the beltline. The south corridor uses Park Street until Badger Road then turning to follow Fish Hatchery Road.

BRT service could coordinate with Metro's existing and potential express bus service for further enhancement of service. Express bus is distinct from BRT and serves a different purpose. It's a limited-stop route that primarily connects residential and employment areas during peak communing hours. For example, Metro's route 75 (downtown Madison and Verona/Epic) has five stops between the Capitol and the beltline, then has no stops until it reaches Verona, where it stops another seven times. This route has four round trips per day, whereas BRT might have between 60 and 70 trips.

In some communities that could be served by future express bus service, a similar assessment of redevelopment potential has occurred as part of Future Urban Development Area (FUDA) planning studies.

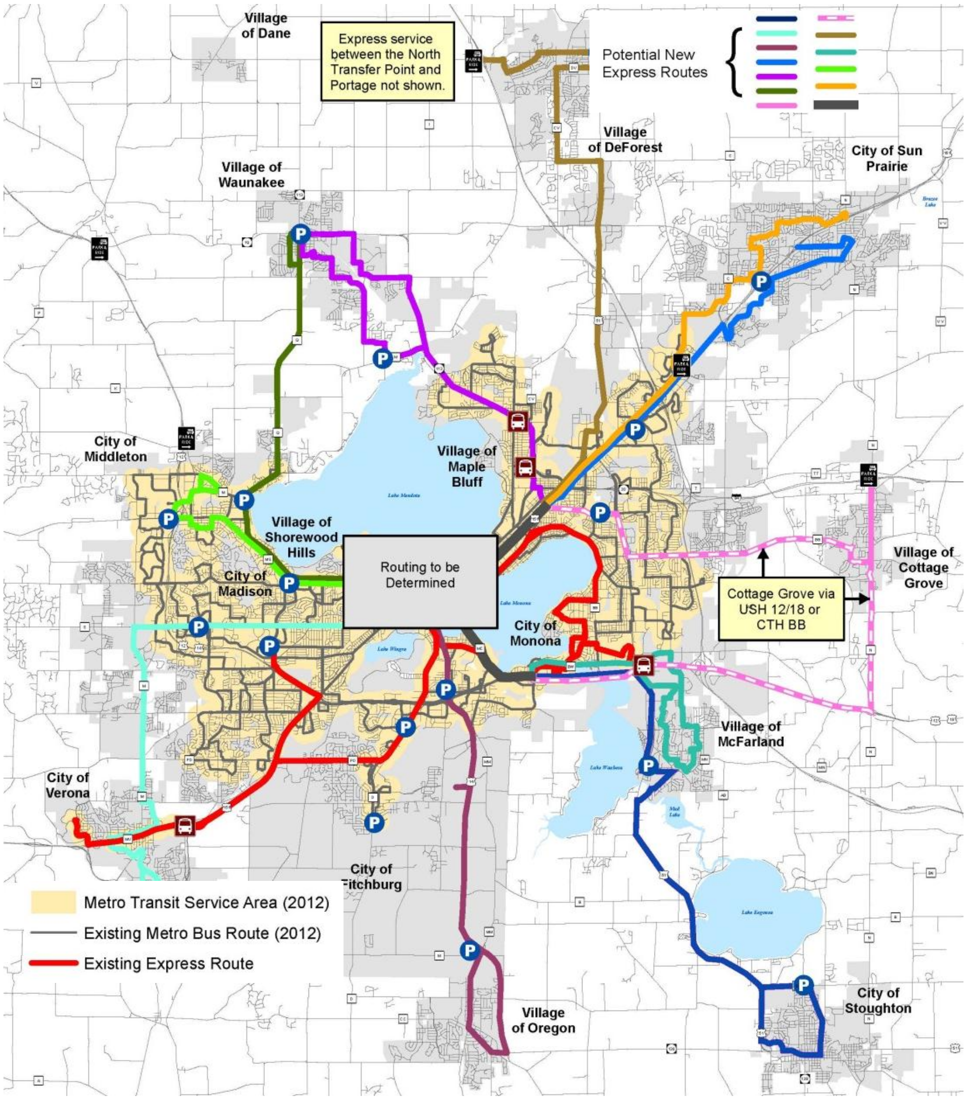


Figure 5: Current and potential future express bus service

Infill and Redevelopment Assessment Methodology

The methodology to estimate the infill and redevelopment potential along these corridors had essentially three components. First potential infill/redevelopment sites were identified using a variety of property information and a visual assessment. Next, a development program, or the mix of uses and building types, was established for each site. A rough estimate on the timeframe of development was also created during this phase. Lastly, the development potential was summarized by corridors as well as timeframe of development. A brief discussion of each component follows.

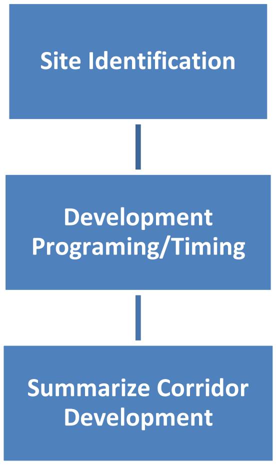


Figure 6: Methodology Diagram

Site Identification

Development sites for the infill and redevelopment assessment were selected based on data from a variety of sources. Along the corridors, a property inventory was established that included parcels located within ¼ mile (a standard value for walking distance or about 2 blocks) of the initial corridors studied.[1] With primary, alternative and potential extensions of routes, the parcel inventory grew to approximately 30,000 parcels.

The following factors were considered when selecting infill and redevelopment sites. See the appendix for corridor mapping and discussion regarding each of the factors.

- Land Value to Improvement Value Ratio
- Change in Improvement Value Since 2000
- Floor Area Ratio (FAR)
- Total Value Per Acre
- Existing Plans and Studies
- Parcel/Site Size
- Ownership Patterns
- Tax Delinquency
- Vacancy

Lastly, a visual inspection of the corridors was also made to select potential redevelopment sites for further evaluation. Each of the above factors was mapped using the parcel inventory discussed previously. The information for each parcel was considered and the project team used its combined professional judgment in determining whether a property would be considered an infill or redevelopment site.

Out of this evaluation, approximately 160 redevelopment parcels were identified. The East Washington Corridor had the most redevelopment sites of all the corridors, followed by the West corridor and the Park Street Corridor.

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[1] The initial study corridors used to create the property inventory included alternatives and extensions that have since been eliminated from consideration, upon recommendation of the BRT consultant. See the appendix for a map containing all alternatives initially considered.

The series on images on the right are excerpts from the analytical maps created to show areas that might be prone to redevelopment. In each maps, the red and orange area indicate properties that are more likely to change/redevelop based on a particular metric. Green indicates the properties are more stable per that metric. From the top, the maps are value to improvement ratio, improvement value growth since 2010, FAR (commercial buildings only) and total value per acre.

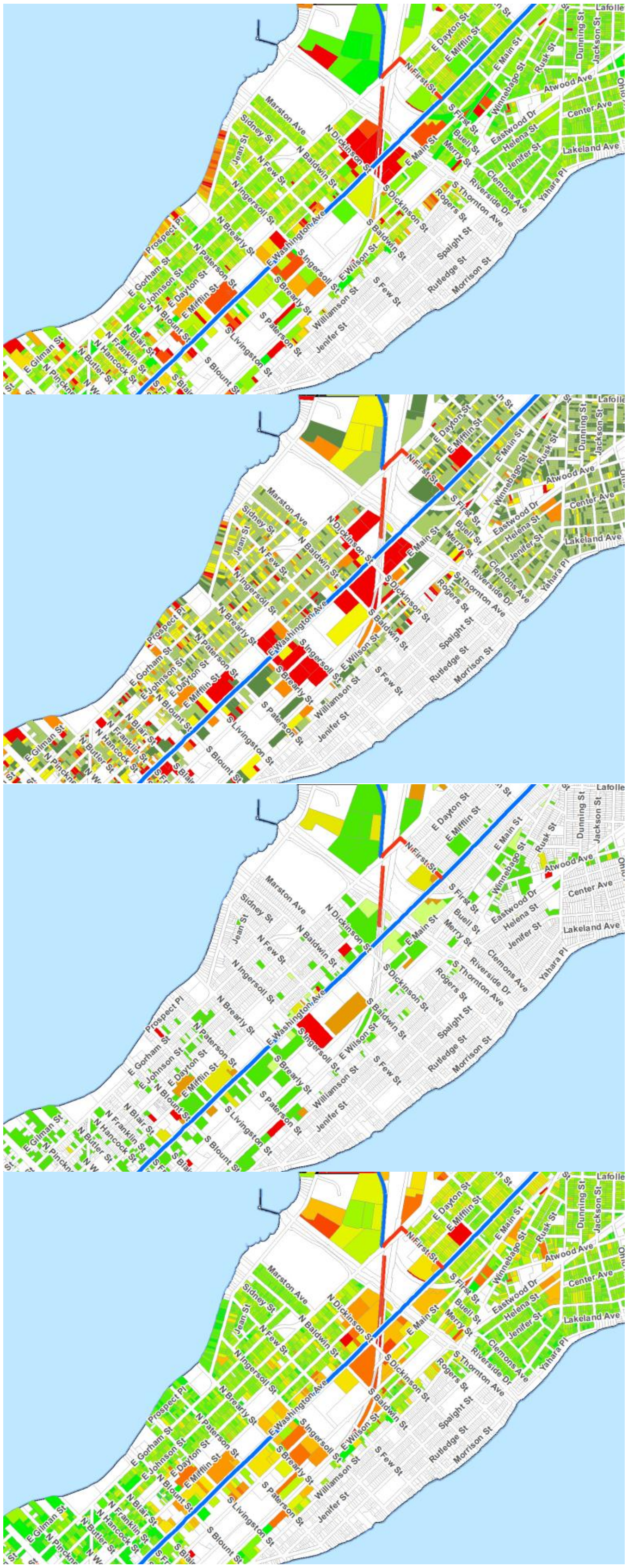


Figure 7: Analytical maps used to identify infill and redevelopment sites.

Hypothetical Timeframe of Redevelopment

Once redevelopment/infill sites were identified (which were often comprised of multiple parcels), they were given a hypothetical timeframe of redevelopment based on all factors discussed. The purpose of the timeframe was to separate and provide distinct information about sites that appeared most likely to redevelop in near future and those that appeared to have redevelopment potential but would face challenges with the site's current characteristics.

The timeframes utilized included short, intermediate and long-term and while these were not considered precise measures, the staff team used 0-10, 11-20 and greater than 20 years as unofficial intervals during discussions. The introduction of BRT could accelerate the timing of some of the sites by creating more demand in locations along the corridors.

Data Limitations

There are some limitations to the above mentioned factors. First is an acknowledgement that assessed value does not equal market value of a property. This is especially true for manufacturing or industrial properties, where assessments are determined by the state. While market value would be best, it would be difficult to obtain for such a large number of parcels, and according to state statutes assessed value is must be within 10% of market value at least once every 5 years.

Another issue with using assessment information is there are no valuation data for properties owned by tax-exempt organizations, such as public agencies, non-profits or churches. This creates holes in the data and these properties must be handled on a case by case basis.

Sites occupying multiple properties also created challenges. There were several instances where buildings were located on one parcel and associated parking or other use was on an adjacent property. This created sites with some properties having a very high improvement to land values or FAR and other without significant improvement values. As a result of data limitations, and the general uncertainty in estimating future development, the project team sought to use "conservative" estimates (when in doubt, erring on the side of lower development and longer development timelines).

Site Programing

Once sites were identified, the amount of development that could occur on them needed to be established. This development assessment used two different strategies. First, if a building program existed for a site, such as a general development plan (GCP), or a redevelopment plan with detailed estimates of development, the amount of commercial space and residential units specified in the document was incorporated into the assessment. If no building program existed for a particular site, the amount of future development that could occur was estimated using a series of 20 building types, each with specific density values associated with them (commercial FAR and residential units/acre). These building types were applied to various sites or portions thereof to estimate a probable and desirable development outcome, based on the professional judgment of the staff review team. The associated building density figures allowed for calculation of development based on acreage of sites (acreage times density equals housing units or commercial square feet). The 20 building types addressed residential, commercial and mixed-use buildings in a variety of contexts and densities.

The density values for the building types were calculated based on the number of stories, the amount of parking required, how parking would be handled (structured or surface), and the amount of open space on site. These density values were adjusted slightly based on a comparison of existing developments' densities.

Corridor assessment maps on the following pages show the building type numbers. Residential buildings are coded in the teens, commercial in the twenties and mixed-use buildings in the thirties. Within a category, higher numbers depict greater building scale.

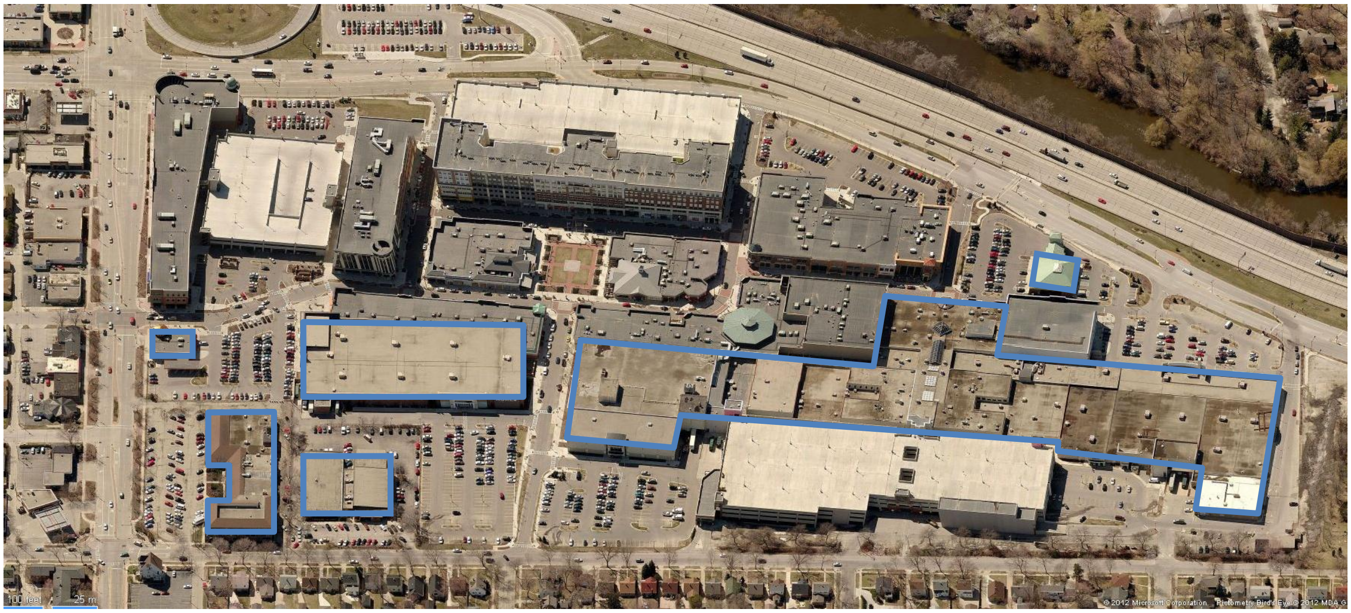
Redevelopment Building Types			*Units per Acre*	*Commercial FAR*
Residential	*11*	*Townhomes*	*20*	*0*
	12	*3 Story - surface parking*	*30*	*0*
	13	*3 Story - structured parking*	*55*	*0*
	14	*4 Story - surface parking*	*40*	*0*
	15	*4 Story - structured parking*	*70*	*0*
	16	*6 Story - mixed parking*	*Not used*	*0*
	17	*6 Story - structured parking*	*85*	*0*
	18	8 story - structured parking	*100*	*0*
Commercial	21	1 story - surface parking	*0*	*0.3*
	22	2 story - surface parking	*0*	*0.4*
	23	3 story - surface parking	*0*	*0.6*
	24	4 story - mixed parking	*0*	*0.75*
	25	4 story - structured parking	*0*	*1.4*
	26	6 story - structured parking	*0*	*2.25*
	27	8 story - structured parking	*0*	*3*
Mixed-Use	31	1 story comm, 2 story res; 3 total	*30*	*0.25*
	32	1 story comm, 3 story res; 4 total	*40*	*0.25*
	33	1 story comm, 5 story res; 6 total	*60*	*0.25*
	34	2 story comm, 4 story res; 6 total	*65*	*0.8*
	35	2 story comm, 6 story res; 8 total	*100*	*0.8*

Figure 8: Hypothetical building types used to program infill and redevelopment sites

Sites Not Programmed

Two areas - East Towne and West Towne mall properties and surrounding outlots and large format retail – were not programmed due to the difficulty in estimating future development potential on such large areas. Around the country, there are many examples of enclosed shopping centers from the 1960's and 70's redeveloping into thriving mixed-used retail, residential and entertainment districts.

The most notable redevelopment near Madison is Bayshore Town Center in Glendale, WI, just north Milwaukee. Previously an enclosed mall with strip retail on a 52 acre site, Bayshore added a street system, public spaces and 500,000 square feet of commercial space and new residential units. This nearly doubled the density of the site and brings the total square footage to 1.3 million (0.57 FAR, excluding structured parking). Milwaukee County Transit Service recently upgraded transit service to Bayshore with the introduction of the MetroEXpress Green Line. While not a BRT system, the new route increases frequency, with less than 15 minutes per bus for most of the day, and eliminates half of the previous stops by moving to ¼ mile spacing.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© 2012 Microsoft Corporation Pictometry Bird's Eye © 2012 MDA G

Figure 9: A birdseye view of Bayshore Town Center in Milwaukee. Buildings outline in blue were existing prior to redevelopment.

Another case study worth mentioning is Belmar in Lakewood, CO, where a complete redevelopment of the 104 acre site occurred. The 1.3 million square foot Villa Italia mall (0.28 FAR), which opened in 1966, was demolished and replaced with 1.1 million square feet of retail, 900,000 square feet of office space and 1,300 residential units (a commercial FAR of 0.44 and residential density of 12.5 units per acre). The award-winning project is one mile from Denver's west light rail line (under construction) and is served by local and express busses.

Transformations of this scale may not occur rapidly or at all, and there is no known indication the properties owners are considering such a change. However, its beneficial to understand the long-term potential growth capacity for these areas.

While specific estimates for East and West Town areas are not feasible, their size combined with large areas of surface parking, create the largest potential infill and redevelopment opportunities along the corridors, if not in the entire City. Bayshore and Belmare provide glimpses into the potential of these sites.

If East Towne area was redeveloped with similar increases in density as Bayshore or Belmar, it could add between 500 and 1,000 units and 500,000 to 750,000 square feet of commercial space. One major challenge East Towne will face if it redevelops is its lack of connectivity to surrounding areas. The site is largely constrained by I-94 to the east, rail and environmental corridors to the south and a large hill side to the north. The mall’s irregular shape could also create difficulty in phased redevelopment.

Similarly, the West Towne area could add 300,000 to 600,000 square feet and 600 to 1,200 residential units. West Towne, however, does not have some of the site constraints facing East Towne; its better connected with neighboring areas and the more linear shape of the buildings makes incremental intensification more practical.

Together, East Towne and West Towne have the potential for an enormous amount of growth, having the capacity to add between 800,000 and 1,350,000 square feet of commercial and between 1,100 and 2,200 residential units.

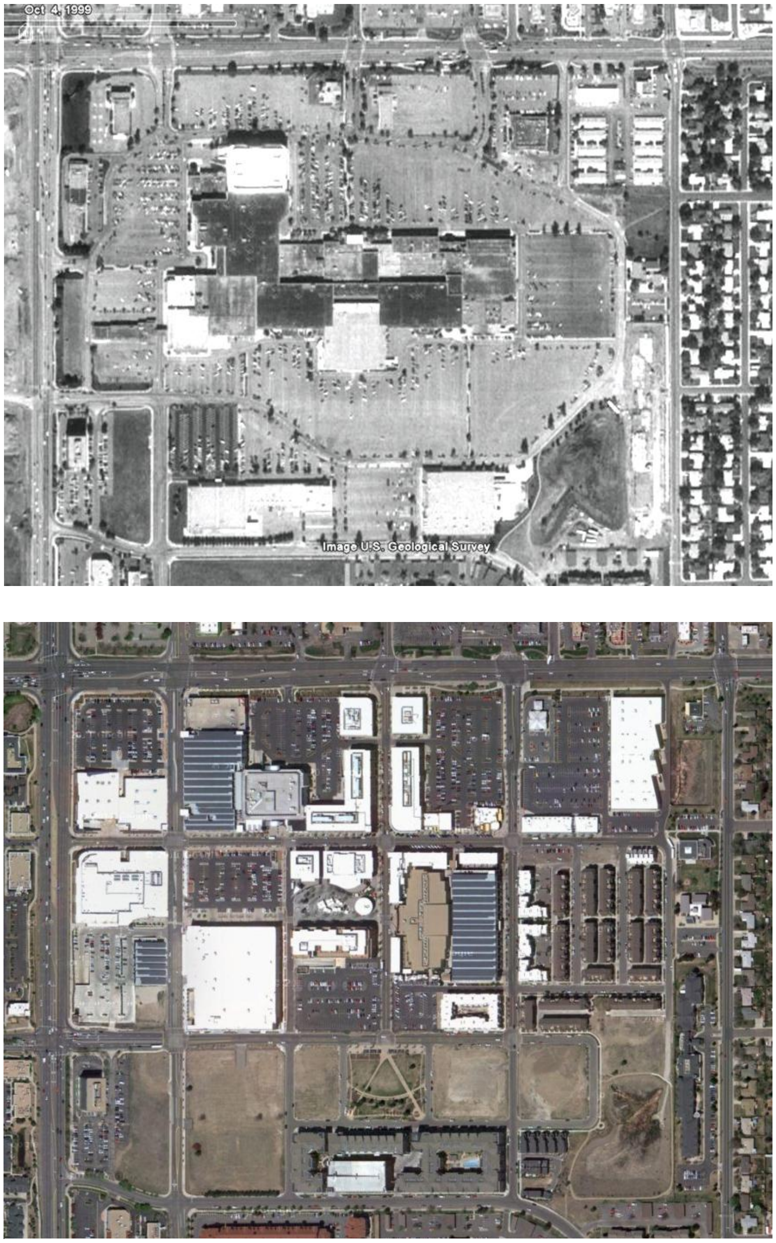
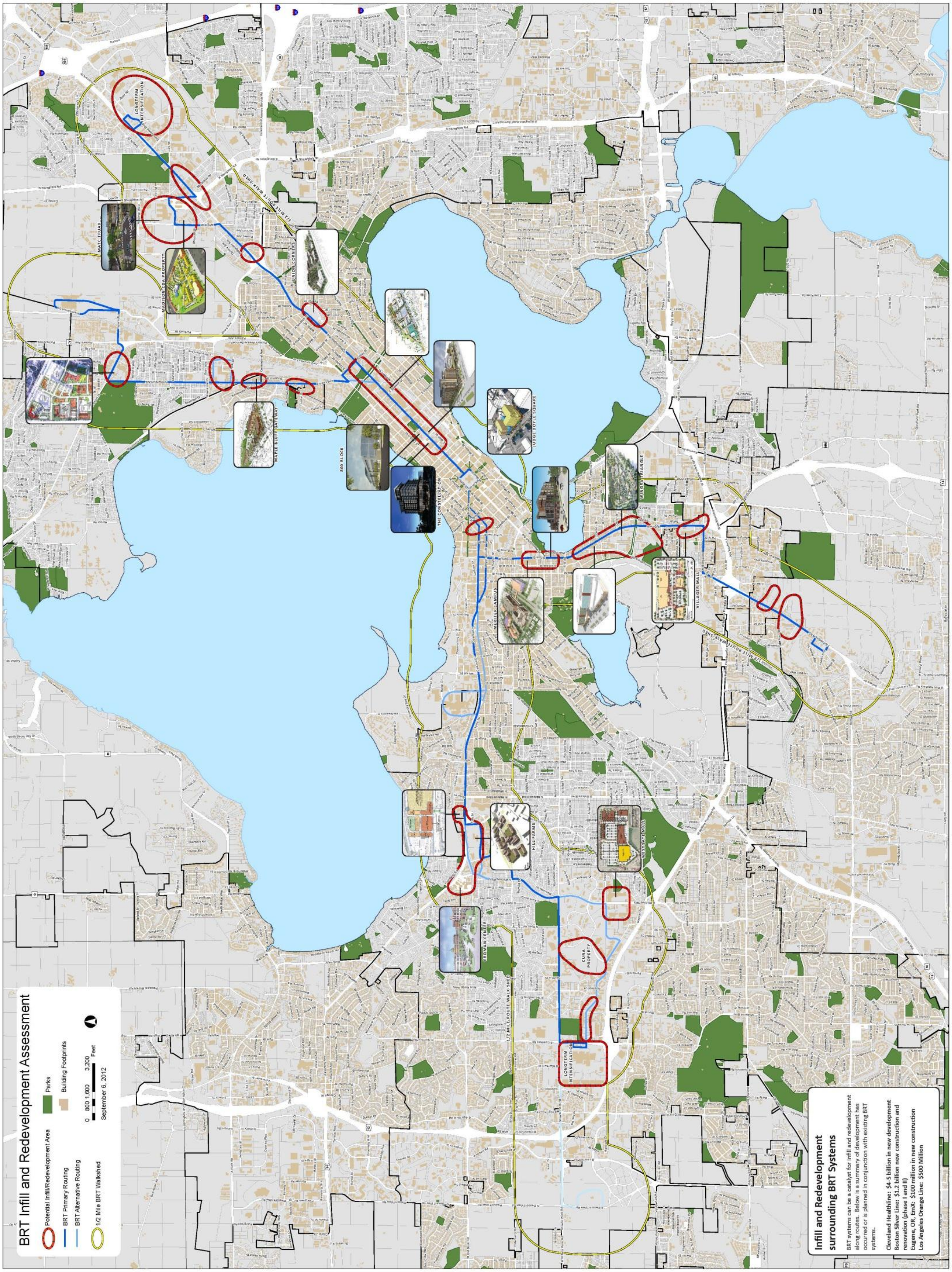


Figure 10: Aerial photos of Belmar before (above) and after redevelopment (below)



Infill and Redevelopment surrounding BRT Systems

BRT systems can be a catalyst for infill and redevelopment along routes. Below is a summary of development has occurred or is planned in conjunction with existing BRT systems.

Cleveland Healthline: $4-5 billion in new development
Boston Silver Line: $1.2 billion new construction and renovation (phase I and II)
Eugene, OR, EmX: $100 million in new construction
Los Angeles Orange Line: $500 Million

Figure 11: Summary map of major infill and redevelopment areas.

Findings: Infill and Redevelopment Opportunities

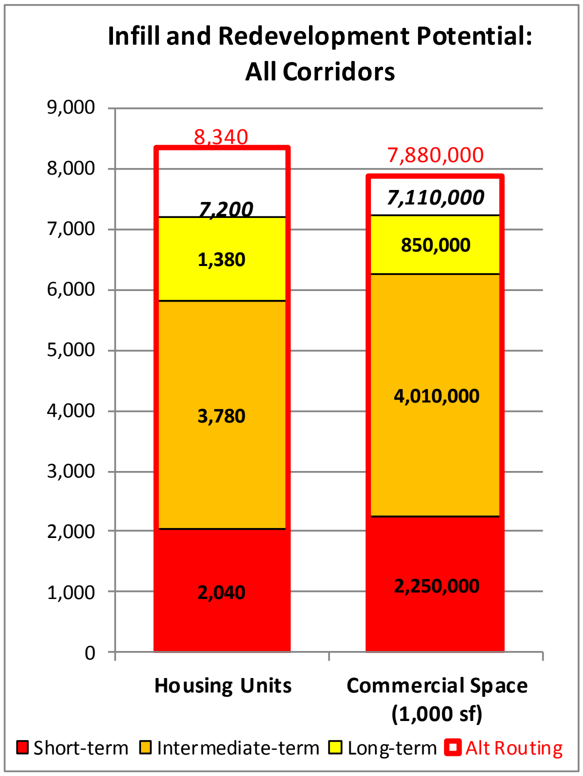
After each site was assigned a building program and all staff reviews were completed, the development potential was summarized for the routes individually and collectively. Overall, the identified sites have the potential to add approximately 7,200 housing units and 7.1 million square feet of commercial space on the primary corridors, not including East and West Towne areas. One alternative routing on the west corridor was still under consideration at the time this report was written (Odana instead of Mineral Point Road), If this alternative routing is used the potential development increases about 15%. The residential component includes townhomes (single family attached) and multifamily units only, since single-family detached housing is generally not suitable along major transportation corridors.

The largest concentrations of redevelopment opportunities occurred in a handful of locations. On East Washington, the isthmus area had the greatest potential, with the Union Corners site and several parcels west of 1st Street. In the longer-term, East Towne area is a major opportunity. On the Park Street corridor, the Wingra Triangle area and surrounding properties (including the Thorstad Chevy site) has the greatest potential, though significant opportunities exist on Park near Monona Bay. On the West corridor, in addition to the West Towne area, major opportunities exist surrounding the intersection of University Avenue and Whitney Way, as well as on the 70 acre CUNA mutual property, spanning between Mineral Point and Odana Roads. The North corridor is characterized by smaller sites and infill of existing developments on Sherman Rd. The map on the previous page shows several of the major redevelopment areas and existing redevelopment concepts that exist for those sites.

Approximately 85% of the identified development potential was believed to have the ability to develop in the short or intermediate terms (0-10 and 10-20 years) based on existing site conditions, however there is no certainty that these properties will redevelop in the specified timeframes. Short-term sites are generally characterized by vacant land, largely vacant buildings or sites where development activity is expected shortly, such as those being sold by the City of Madison Request for Proposal (RFP) process. Intermediate-term sites may have a higher occupancy levels or value to them, but appear as good candidates for development due to low site utilization levels. Long-term sites generally show underutilization and redevelopment potential, but face challenges such as high levels of occupancy, varied ownership, in areas of weak market absorption or near several sites that would be expected to redevelop first.

While it is recognized not all development would likely occur, the potential value and occupancy capacity of these sites is significant. The 160 sites conservatively have value capacity of over $2.6 billion dollars. Values were estimated on a per square foot basis, referencing RS Means Construction Cost Estimator data for the appropriate building type.

Figure 13: Summary of infill and redevelopment potential: all corridors



These sites would result in nearly 44,000 people occupying those sites. This estimate includes a mix of new residents, employees and customers which could utilize the BRT system and provide an additional ridership base. Approximately 1/3rd of these occupants would be residents.

Infill and Redevelopment Potential	Value	New Population (residents, employees, customers)
East Corridor	$1,245,000,000	18,970
North Corridor	$125,000,000	1,980
West Corridor	$620,000,000	10,510
West Corridor Alt Route	*$285,000,000*	*5,680*
South Corridor	$365,000,000	6,550
Total	**$2,640,000,000**	**43,690**

Figure 14: Value and Occupants of Redevelopment

The development estimates represent a likely development outcome[2] if the property redevelops. The market study will provide more information on the likelihood of development in the corridor. Market forces constantly change and will do so in the future.

The following pages will provide discussion and additional details on larger sites in the corridors. Complete maps with all sites and development assumptions are available in the appendix.

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[2] This was based on the context and general understanding of recent development trends. This was not a maximum capacity based on existing zoning.

Corridors in Detail: East Corridor

The east corridor travels from the Capitol square to East Towne Mall generally along East Washington Avenue. All together, the East Washington corridor has the capacity for approximately nearly 4,000 housing units and 3.4 million square feet of commercial space in identified infill and redevelopment sites.

Capitol Square to First (Capitol East District)

Between the Capitol Square and First Street, the East Washington corridor is comprised of relatively large parcels often with significant redevelopment opportunity. These include several City-owned properties which are actively being developed through the City's land bank program. BRT could serve as a boost for redevelopment in this area because it would be served by both the east-west and north-south corridor routes.

The City also owns large a parking lot at East Washington and Butler Street (1) serving the nearby State office building, and has issued RFP's for the 700 and 800 block parcels it owns (2). Other major redevelopment options include the Reynolds properties (3) the Mautz Paint site (4) and former Land O'Lakes Dairy (5).

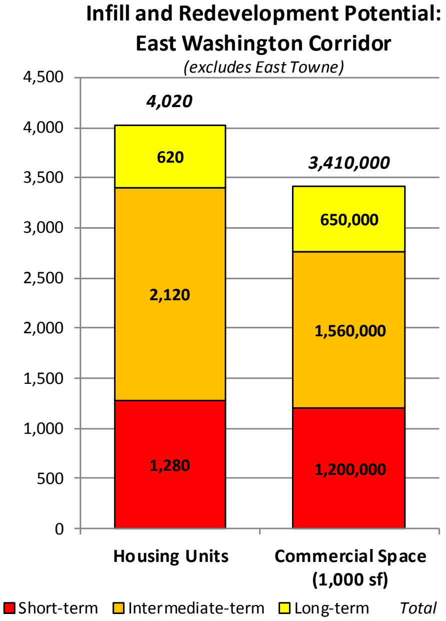

Figure 15: Summary of infill and redevelopment potential: East Corridor

A developer has recently proposed a six story, 250 unit residential building on the Reynolds property. However the proposal does not appear consistent with existing plans and would likely require multiple changes in plans and zoning to be approved.

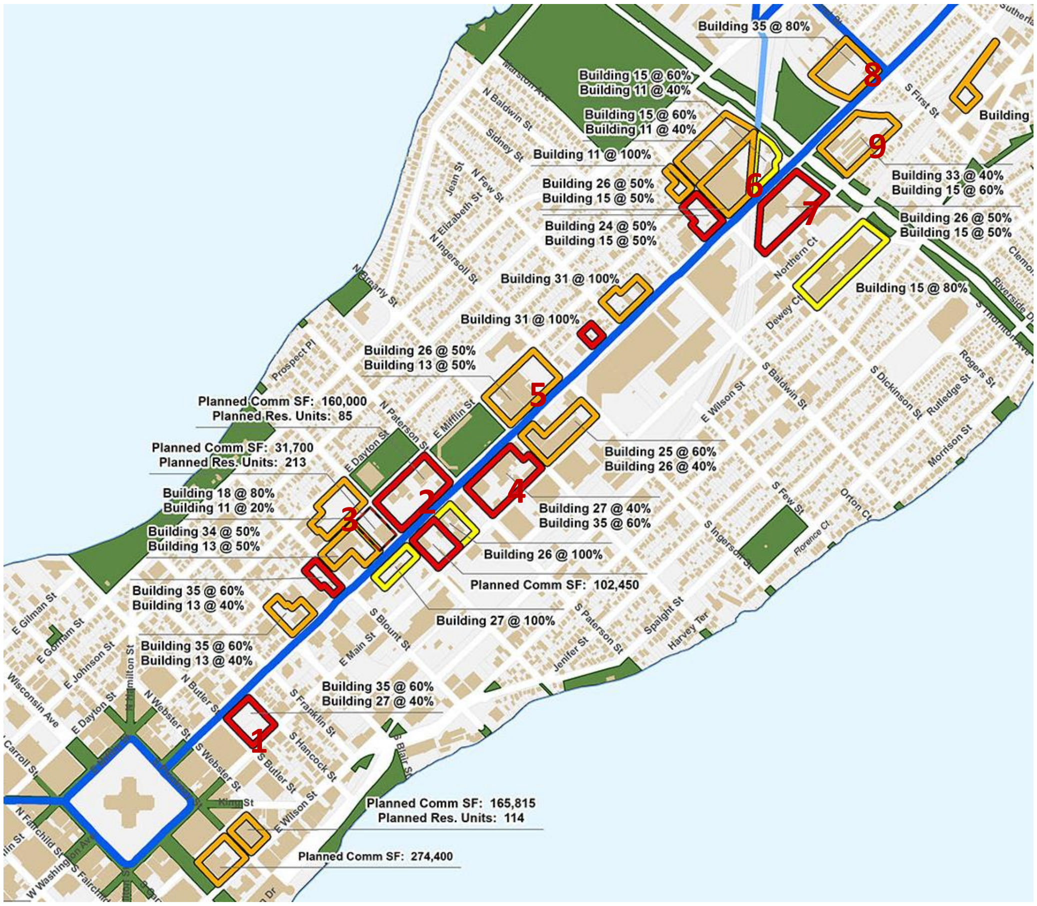

Figure 16: Infill and Redevelopment sites and programs on the East Washington corridor, Capitol to First Street

Development programs for the properties west of the First Avenue are guided by the Capitol East Gateway plan, which details building scales and uses for these sites. Scales of buildings programmed in this area generally range from four to twelve stories, depending on the block face, and the uses are a balance of commercial and residential.

There are some parcels in this area not included in this assessment that are worth mentioning as they have future development potential. First are the MGE storage yards and the City water service building. These two underutilized properties take up a two block area on Main Street between Paterson and Livingston streets. Since MGE, the owner of the primary parcel, is tax exempt, their holding costs are not likely an inducement to sell. Another property with long-term potential is the Metro facility at Ingersoll and East Washington. While the building currently exceeds its bus storage capacity and an additional facility may be needed, its location serves Metro well. A long-term vision for this property may be similar to the Grand River Station Transit facility developed in Lacrosse, WI, which features a transit center, ground level retail, structured parking and nearly 100 residential units above.

The intersection of the Yahara River and East Washington is surrounded by several redevelopment opportunities. On the west side of the Yahara River, there are several underutilized former industrial parcels, along with a vacant historic restaurant and the Washington Square office building (6) and single story commercial buildings (7). With the exception of an auto body shop and a second building, all of these parcels are owned by the Mullins Group. The north corridor's busway crossing the Yahara River may require some land contained in these properties. East of the Yahara and abutting Burr Jones Park is a dated strip retail building with several vacancies and a large parking area at the street (8). To the south is an active lumber yard (9) all of which are an underutilization of highly desirable land.

First Street to Fair Oaks/Wright Streets

The next major redevelopment area is the Union Corners site (10) at East Washington Avenue and Milwaukee Street. The City of Madison recently released an RFP for development on this site and is in the process of reviewing responses. This site is more neighborhood-oriented than those to the west, and a slightly lower scale would be anticipated. Development projections for this site followed details provided in the previous Union Corners general development plan. The two proposals under final consideration envision approximately 160-180 residential units and 160,000 to 185,000 square feet of commercial space.

A cluster of redevelopment areas surround the intersection of Hwy 30 and East Washington (11). Some of these sites have been identified in previous planning studies as appropriate for gateway commercial office, supported by access and visibility from the highway.

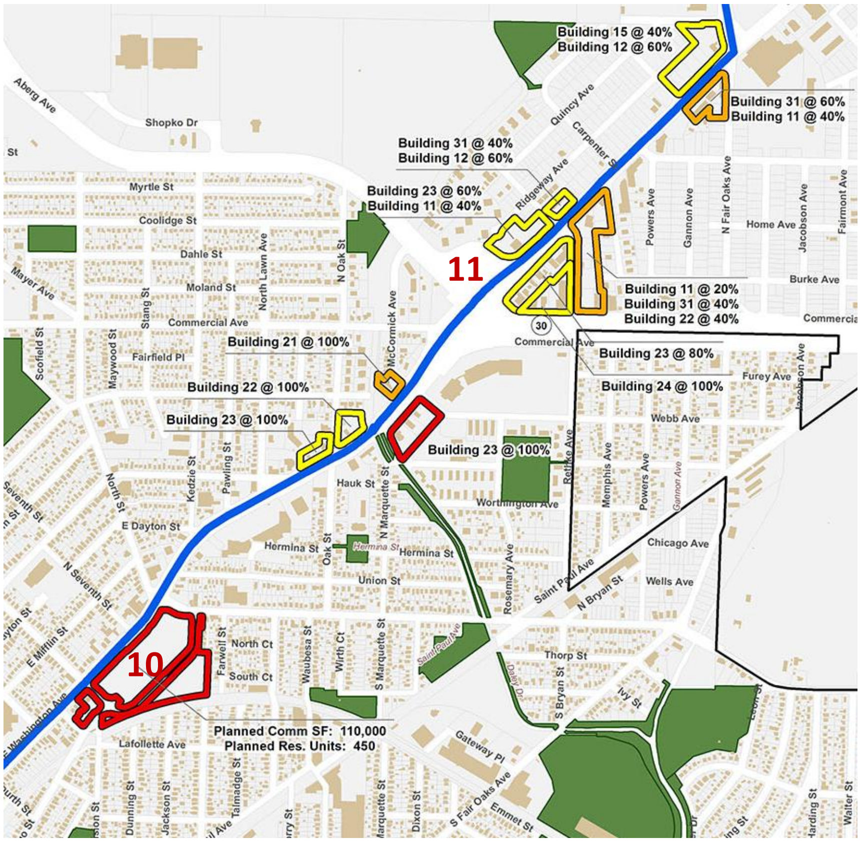

Figure 17: Infill and Redevelopment sites and programs on the East Washington corridor, between Fourth Street and the Hwy 30 area.

Fair Oaks/Wright Streets to East Town

Several major redevelopment sites are situated near Hwy 51 and East Washington. One of the more significant may be the planned expansion of Madison Area Technical College (12), which may add up to one million sf of new institutional space[3]. Across the street from MATC, the Madison Housing Authority plans a redevelopment of its property (13), which would add 180 new homes. These two redevelopments were not included in the assessment calculations, due to their institutional/public nature, however they are discussed as they have the potential to generate significant future ridership.

On the southeast corner of East Washington and Hwy 51, a larger redevelopment area could see a mix of commercial and residential buildings. Across Hwy 51, the new Hyvee grocery store and abutting vacant parcels (14) have the capacity for additional commercial development at the street frontage.

East Towne

East Towne and its many outlot parcels (15) are the last major infill and redevelopment area. The sites have a significant amount of capacity for additional infill development, however connectivity to and through the sites present challenges. As mentioned before, this site was not included in the development capacity calculations because the scale (over 100 acres on the mall properties and nearly 200 with outlots and surrounding properties, uncertainty with potential development mixes and the unknown nature about when or if the parcel will fully redevelop. See the discussion of East and West Towne malls earlier in the report for further detail on these sites and their potential.

Figure 18: Infill and Redevelopment sites and programs on the East Washington corridor, Hwy 51 to East Towne

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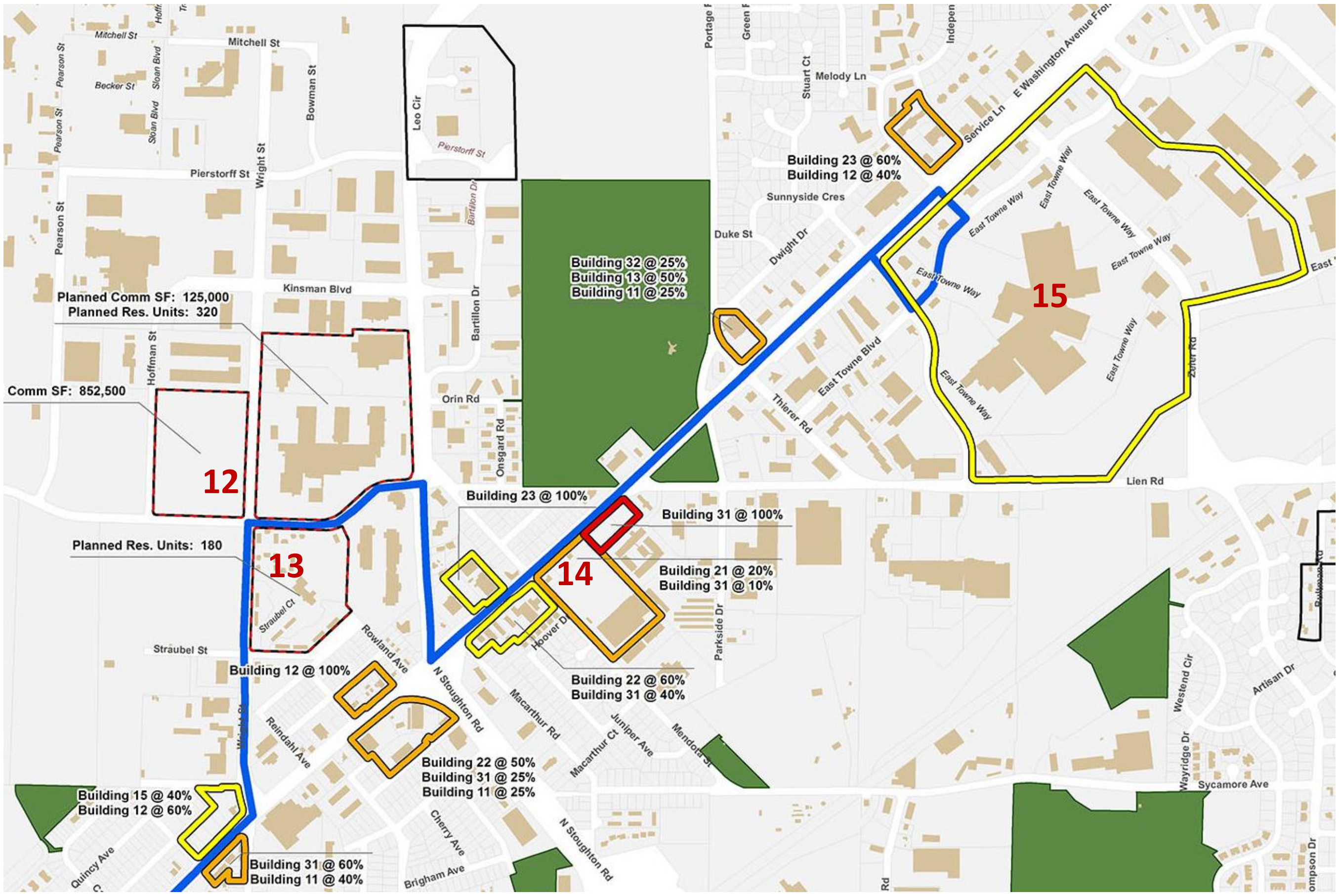

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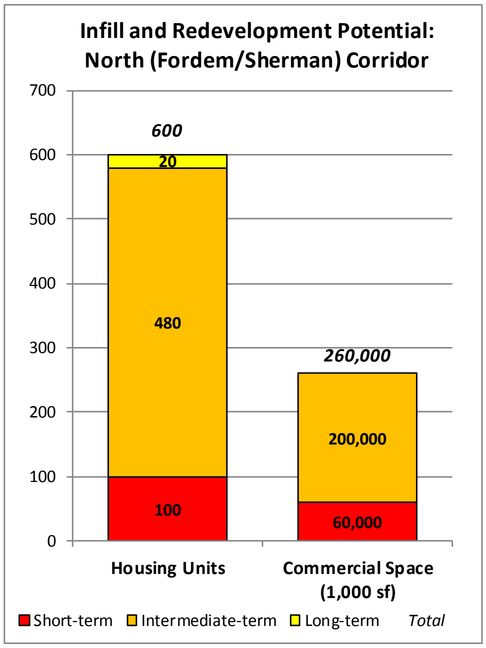
[3] Based on measurements of the campus plan

Corridors in Detail: North Corridor

The north corridor travels generally from East Washington and the Yahara River north via Sherman with service terminating at the airport. Many of the sites are individual parcels and are significantly smaller than those on the East Corridor. Given the relatively few infill and redevelopment sites identified on the north corridor, it's not surprising the identified capacity of the corridor was 600 residential units and 260,000 sf of commercial space.

The triangle at the corner of Sherman and Fordem (16) is the first significant opportunity as the route travels north from East Washington. The prominent corner contains a mix of single story building with large parking areas on parcels overlooking Burrows Park and Lake Mendota. Other major opportunities include the Northgate Shopping Center (17) at Aberg Ave, and the Northside Town Center (18) at Northport Drive. Both are older neighborhood retail centers with large parking areas at the street and have been discussed in the recent Northport-Warner Park-Sherman Neighborhood Plan. While the plan shows long-term replacement of the existing buildings on site, the assessment focuses on mixed use and commercial building infill in appropriate locations on site.

Figure 19: Summary of infill and redevelopment potential: North Corridor



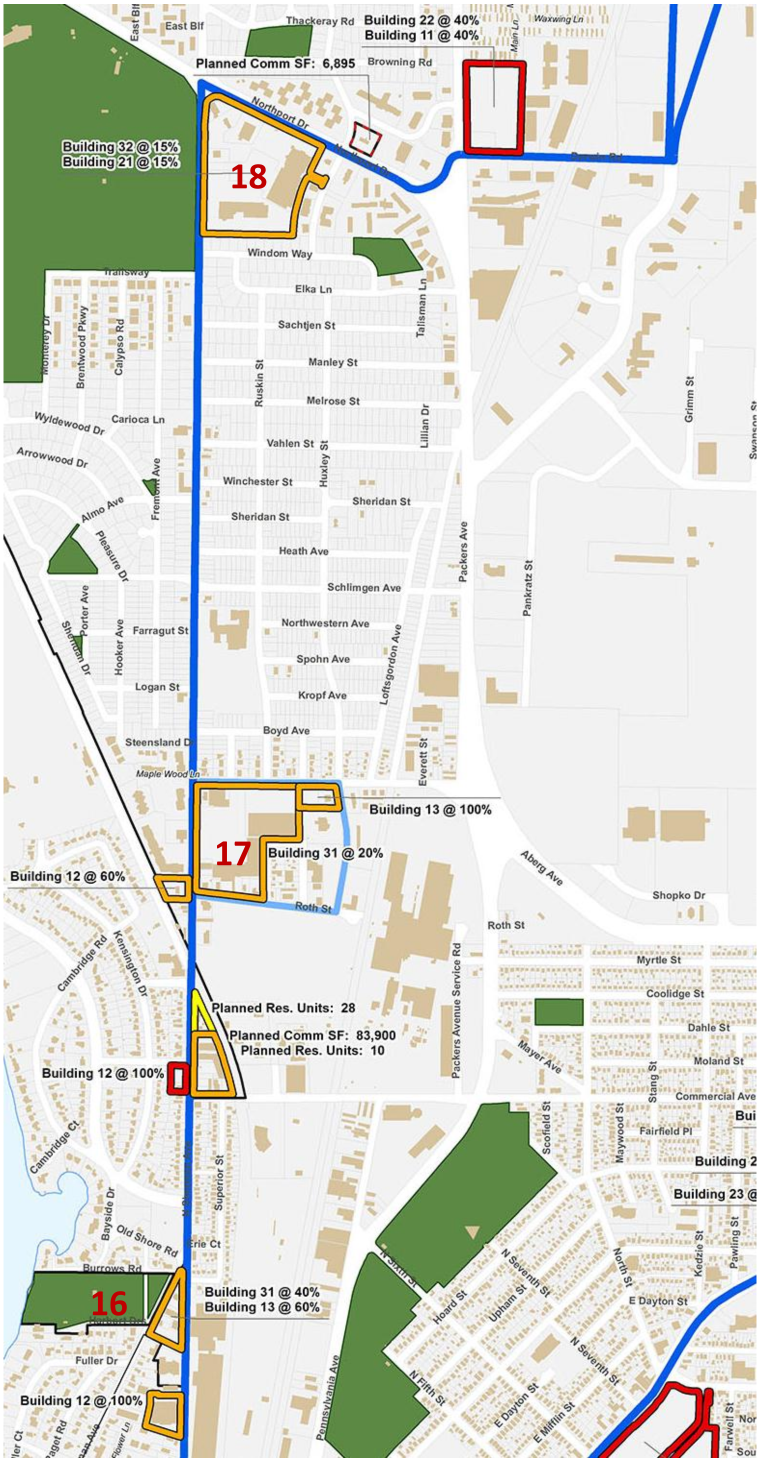


Figure 20: Infill and Redevelopment sites and programs on the North corridor.

Corridors in Detail: West Corridor

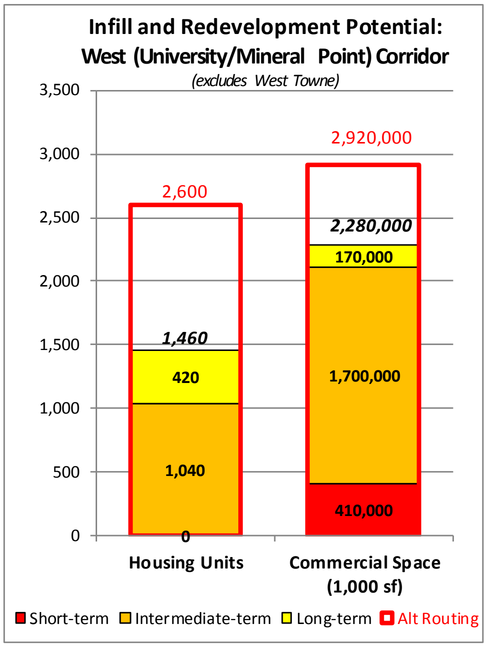


Figure 21: Summary of infill and redevelopment potential: West Corridor

The west corridors generally follows University Avenue before turning south on Whitney Way. It resumes traveling west at either Mineral Point or Odana Road. The corridor has the capacity to add nearly 1,500 residential units and 2.3 million square feet of commercial, with the majority of the redevelopment occurring in the intermediate-term. If it follows the Odana Road alternative corridor, the capacity would increase to nearly 2,600 residential units and to 2.9 million square feet of commercial space. Most of this increase is attributed to the large undeveloped CUNA Mutual property, which is significantly larger on its Odana Road frontage compared to its Mineral Point frontage.

Campus to Whitney Way

Starting from the east, significant redevelopment opportunities do not emerge until west of Campus Drive, with the exception of development outlined in the University of Wisconsin Campus Plan. Like the north corridor, redevelopment sites in this area are relatively small and comprised of few parcels. The Village of Shorewood Hill identified the commercial area at University and University Bay Drive (19) as a redevelopment site, appropriate for intensification of development. There are a select number of sites identified on the south side University Avenue, however the scale, parcel depth and access somewhat limit redevelopment opportunities in this area.

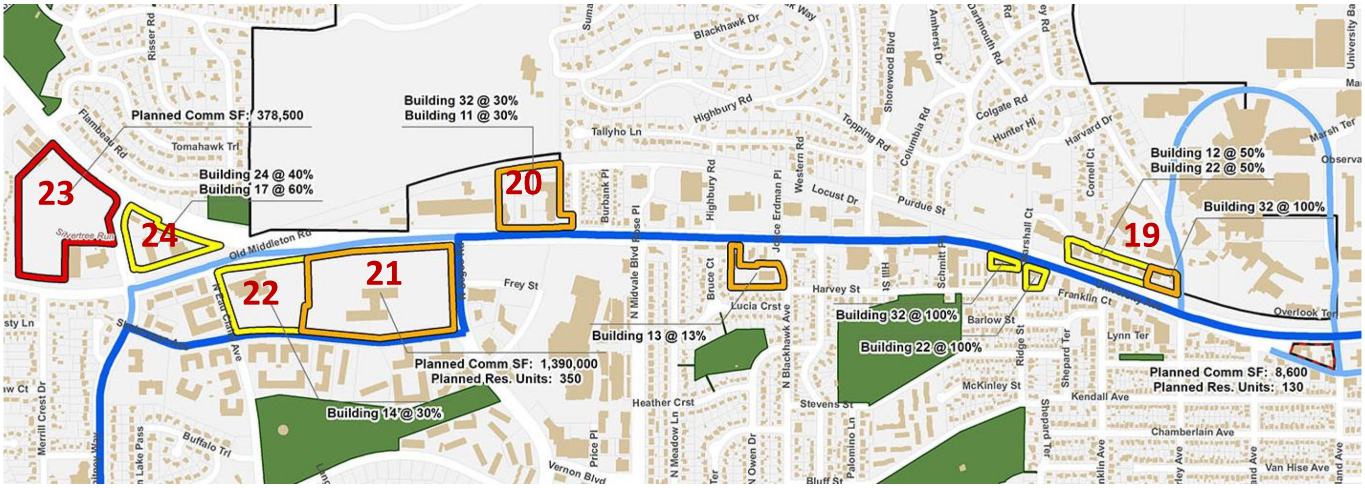


Figure 22: Infill and Redevelopment sites and programs on the West corridor, University Avenue segment

The first significant node of redevelopment sites occurs in the area surrounding University and Whitney Way. The shopping center north of the Hilldale (20) has limited visibility which makes maintaining occupancy challenging and the adjacent circular office tower is described as "dated" by a redevelopment study. That study recommended redevelopment for the site. The 20 acre DOT Hill Farms parcel (21) is a major opportunity, and a general development plan indicated the potential for 1.75 million square feet of new commercial space on the site. The neighboring Red Cross site (22) appears to have more land than is required for its use, which could be used for residential development on Sheboygan Ave. Just West of Whitney Way, the Erdman GDP (23) calls for the development of a health care and employment campus, anchored by UW Health which is currently under construction. Finally, the triangle located between the rail corridor and the intersection (24) appears to have long-term potential to develop beyond its current uses of 1-2 story commercial buildings and transform into a gateway development.

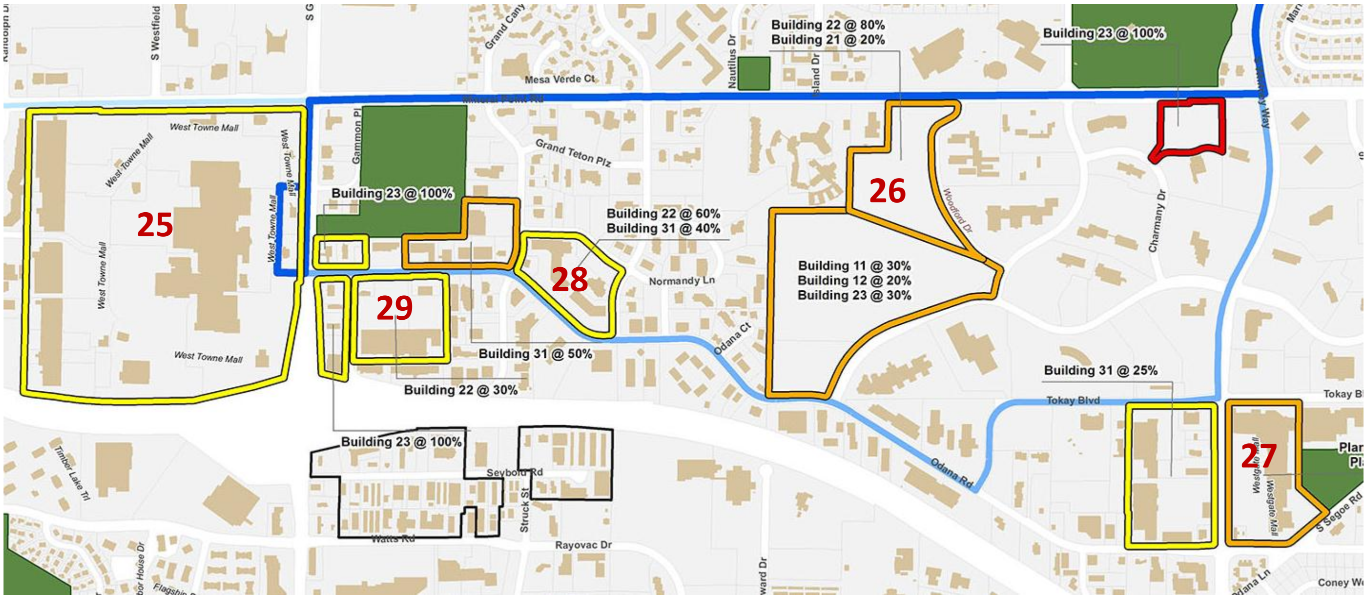
Mineral Point Road and Odana Road

There is relatively little redevelopment opportunities along Mineral Point Road prior to West Towne Mall (25), where the alternative corridor (Odana Rd) meets the primary corridor. One notable exception is the northern end of the CUNA Mutual parcel (26), a 60 acre parcel that extends from Mineral Point to Odana Road. While the future of this parcel is unknown, a mixture of office similar to the neighboring University Research Park would be appropriate.

On the Odana Road corridor, there is more potential for redevelopment. The BRT would serve the Westgate Mall and the Whitney Square shopping center across the street. At Westgate (27), a new grocery store is under construction and a redevelopment plan was created by the malls owner, outlining plans for additional commercial and residential space.

Much of the Odana Road is characterized by dated strip retail, though new development and intensification is happening. The park/stormwater facility on Mineral Point between Grand Canyon and Gammon Road abuts many of these properties and could be an asset that spurs future mixed-use or residential development. The Market Square properties (28), home to a small theater, bank, office and retail space, has struggled to maintain tenants and could transform to a more intense commercial mixed use development. The final site on the Odana corridor is the retail center anchored by Burlington Coat Factory and Joanne Fabrics (29), which could be intensified with future commercial development. One major challenge facing these sites is the lack of amenities to attract high quality development. There is no surrounding neighborhood and the area is primarily strip retail, office and car dealerships. However, the beltline provides significant visibility and accessibility for these parcels.

Figure 23: Infill and Redevelopment sites and programs on the west corridor, Mineral Point/Odana Road segment



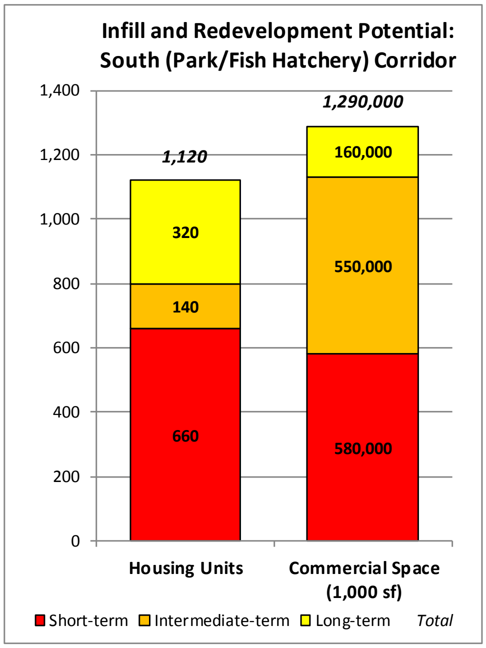
After the Mineral Point/Odana split, the routes return together at West Towne Mall and extend to High Point Road (with a potential extension to the University Research Park). Like East Towne Mall, this large site was not included in the development calculations, but development potential is discussed earlier in the document. West Towne, however, appears more feasible for intensification into a mixed-used retail center due to its building configuration, better street connections to surrounding areas and greater visibility from the highway.

A potential route extension travels west across the beltline on Mineral Point Road and terminates in the future expansion area for the University Research Park. One redevelopment/infill site that could be served by this extension is the newer Prairie Towne Center (not shown). With the introduction of BRT, a limited amount of mixed-use intensification could be developed on the site, adding commercial space and new residential units. This site may also be appropriate for a park and ride, potentially incorporating structured parking. One comment make during discussions about BRT was a park and ride with a grocery store close by may be a way of successfully capturing commutes who would otherwise drive. This site's proximity to the beltline and retail mix (Copps, Target, etc.) make it especially attractive for this purpose.

Corridors in Detail: South Corridor

The south corridor travels from University Ave/Johnson St on Park Street until Badger Road, where it transitions to Fish Hatchery Rd. The corridor continues to the Hatchery Hill area, with a potential extension to the Fitchburg Technology Park. Overall, the Park Street Corridor has the potential to add 1,120 housing units and nearly 1.3 million square feet of commercial space, with approximately half of the potential development identified as short-term sites.

Figure 24: Summary of infill and redevelopment potential: south corridor



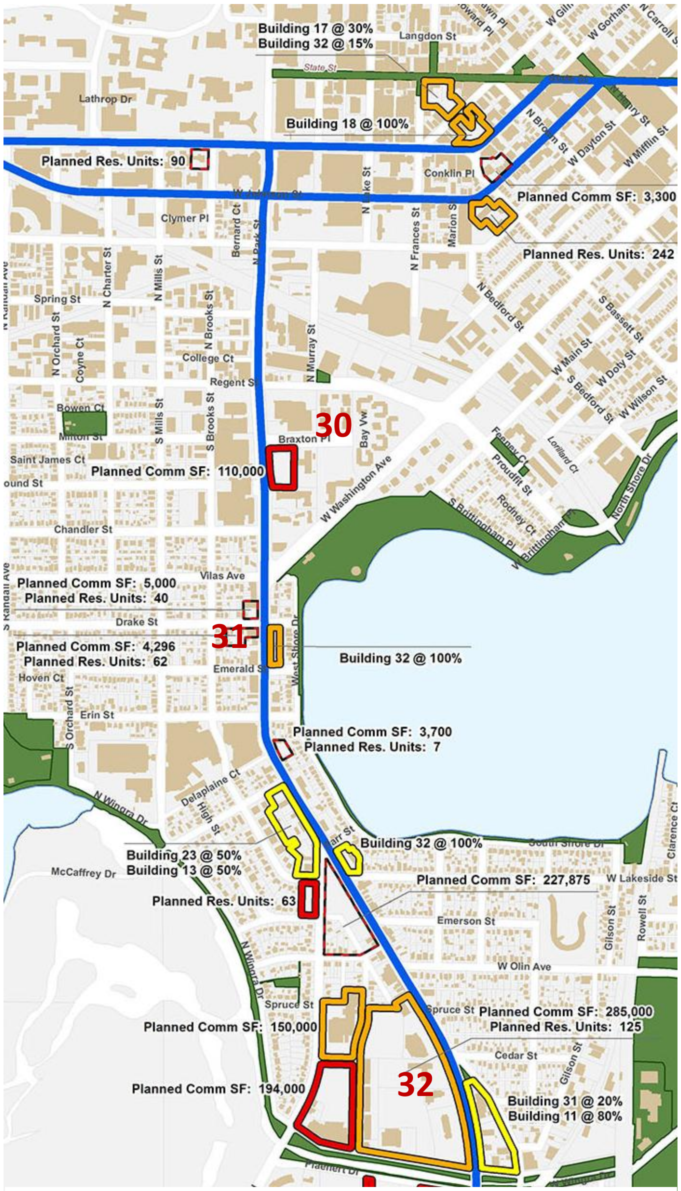


Figure 25: Infill and Redevelopment sites and programs on the south corridor, Park Street between University Ave and Wingra Creek

University Avenue to Wingra Creek

The first cluster of sites identified as the route leaves University Ave is near Monona Bay. Meriter Hospital's Campus Plan outlines their vision for future growth, and includes development on their large parking lot at Braxton Place (30) among other areas. Three blocks south, several sites were identified as being appropriate for future mixed-use development, with residential units on upper floor having lake views. These included planned development on the Ideal Body Shop and Lanes Bakery sites (which were not included in the calculations as they are in the permitting process) as well as the block on the east side of Park Street (31). The proximity to the capitol, campus and the two hospitals has the potential to drive market demand in this area.

The Wingra Triangle (32) is the next major redevelopment area and has been studied by several recent planning efforts. The Wingra BUILD plan identified four key transitional properties total over 13 acres. These include St. Mary's property, the former Dean/Morning Star Dairy (which is currently under construction), Bunbury's parking area and the US Army Reserve parcels. The BUILD study also provided an estimate of future development that could occur on the site, calling for primarily commercial space with complimenting residential uses. In addition to the properties within the triangle, many parcels surrounding the triangle would be appropriate for new mixed residential redevelopment.

Wingra Creek to Hatchery Hill

South of Wingra Creek, the former Thorstad Chevy site (33) is another prime site for redevelopment that was recently purchased. While the large site has significant potential, the geometry and lack of connectivity in this area could hinder site development. A combined development approach addressing surrounding parcels and adding connections to the south and west would increase the development potential.

The Villager Mall (34) on Park Street near Badger Road is an on-going redevelopment site with planned infill sites still remaining in outlot configurations. Across the street, the Comstock Tire and carwash sites could be redeveloped with a complimentary mix of commercial uses.

South of the beltline, the sites generally transition to infill of undeveloped and underdeveloped parcels. These include mostly residential parcels on the east side of Fish Hatchery and commercial or mixed use on the west side. Further south, several vacant parcels are planned for future commercial development near the Fitchburg Technology Center (not shown), which could be served by a potential route extension.

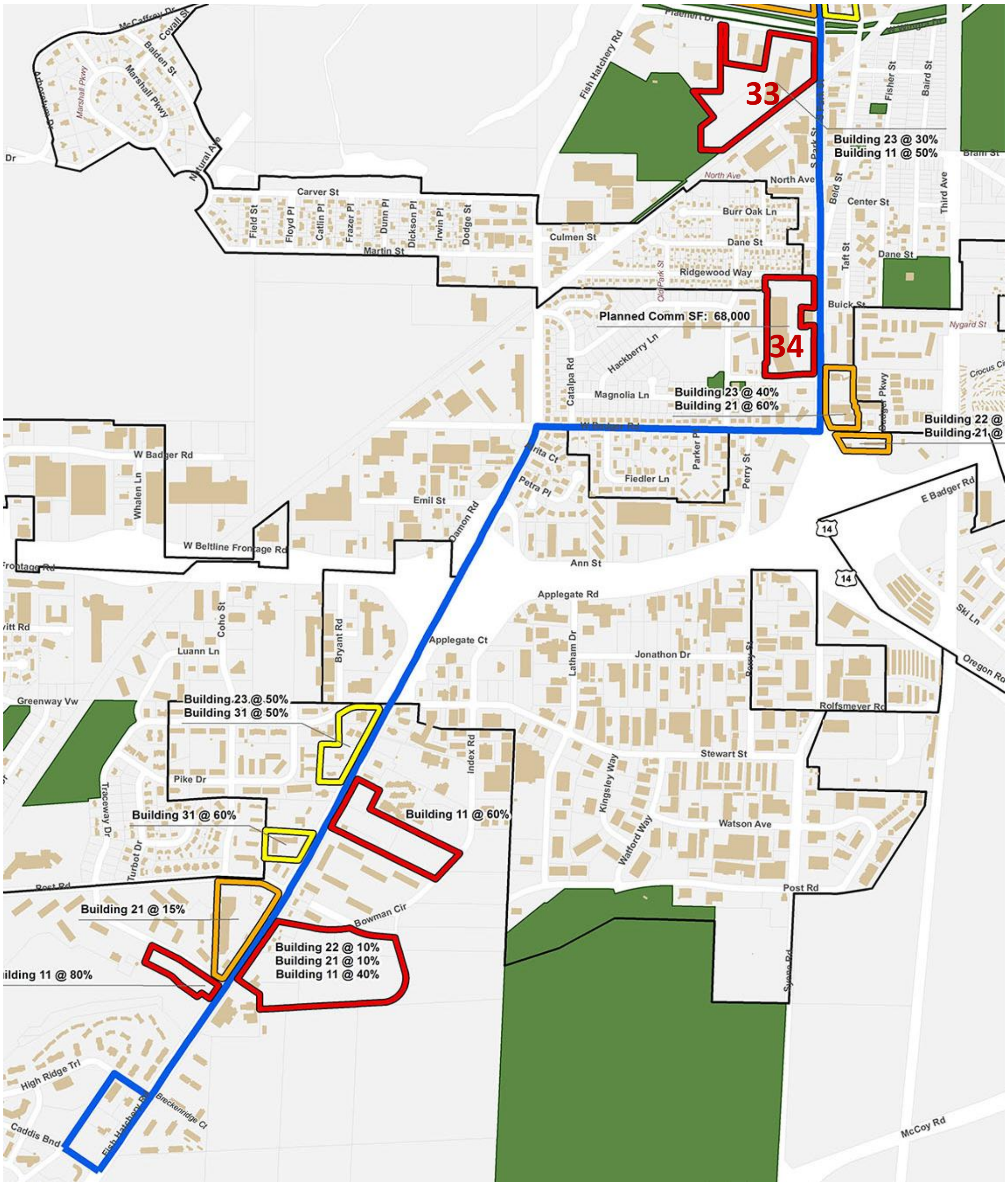
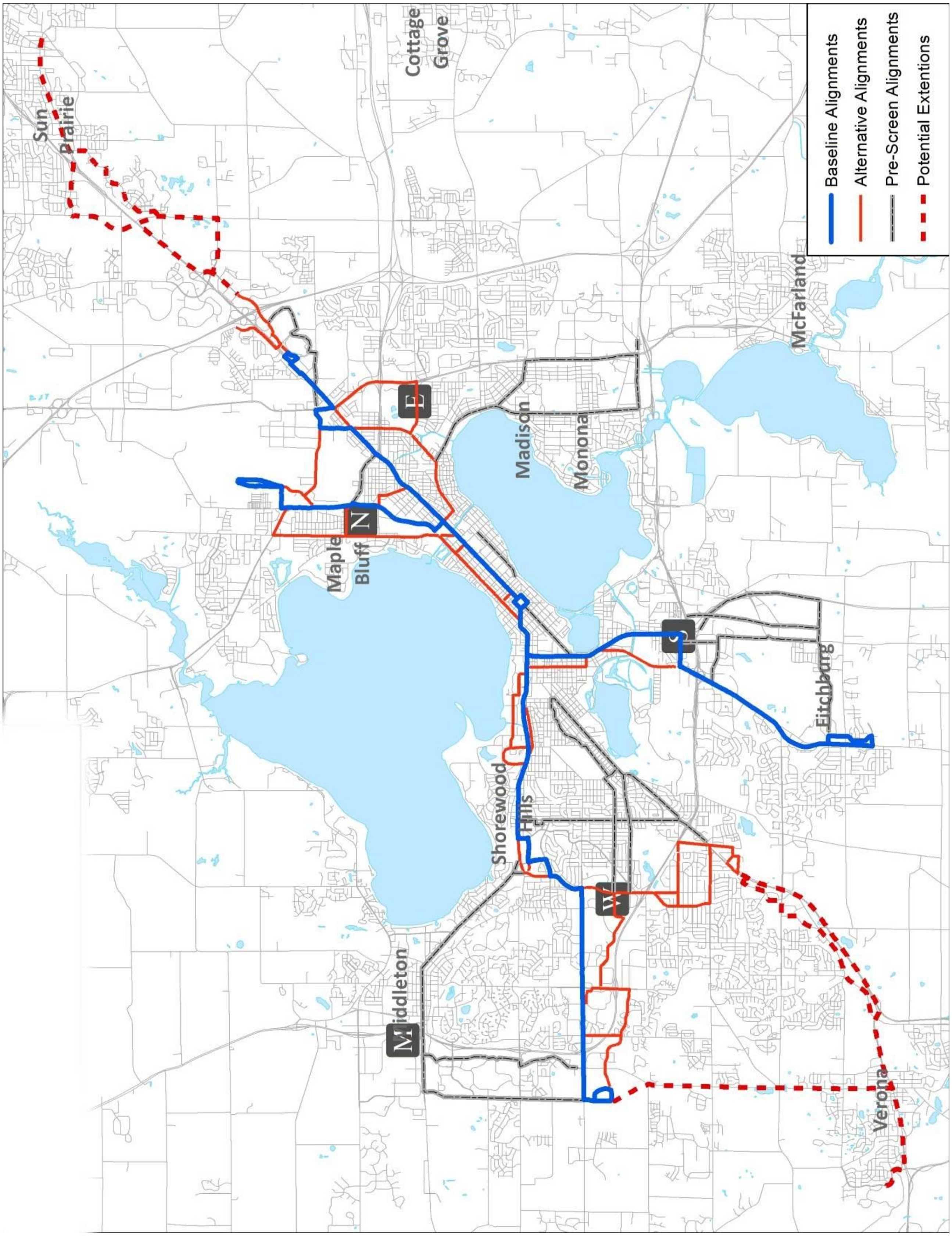


Figure 266: Infill and Redevelopment sites and programs on the south corridor, Park Street between Wingra Creek and Hatchery Hill

Appendix and Supplementary Materials

Map of All Initial BRT Routing Options Studied



Site Identification: Factor Discussion:

Value to Land Ratio: Properties with low improvement values relative to land value are generally underutilized and have a higher likelihood of being redeveloped. A typical properties' land value represents about 20 to 35% of the total parcel value; within the corridors, land value averages 29.2% of a property's total value (or 71.8% of the value comes from the building). While no specific ratio was viewed as a determining factor in site selection, generally a site with land value in excess of improvement value was investigated further.

Change in Improvement (2000-2012): This measures investment, or lack thereof, a property owner made in their building(s). Change in building values was chosen over change in land value because land values are generally more susceptible to external market forces. One such external force is increasing desirability of a neighborhood, which could create gains in value without owners increasing or maintaining their investment in the property. While property values since 2000 have been highly variable, the average property within the study corridors (1/4 mile from the BRT corridors) saw an increase in improvement value of approximately 32% during the 12 year period. Properties that gained less than 20% were given more attention, especially those that lost value.

Floor area ratio (FAR): The ratio of total building area to land area was also considered in order to find properties which are underutilized. Properties with FAR's below 0.2 are generally considered underutilized. For comparison, single story retail with surface parking is approximately 0.25, and the average commercial property in the study area with a building on it has a FAR of 0.41.

While the data was useful in most areas, it only addressed commercial properties and presented some limitations. Building quality was not addressed in the data and could cloud conclusions. For example, some of the storage structures at Marling's Lumber were classified as buildings and contributed to the FAR.

Other challenges arose while interpreting the FAR data. Building assessment data is collected on an individual building basis, not by property. Because of this, if no building exists on a property there is not a record for that property and only commercial properties with a building on then show up in FAR mapping. This is one of the reasons visual inspections of the corridors became important during site selection.

Total Property Value Per Acre: The assumption behind this factor was that buildings on parcels being redeveloped would frequently be demolished, and lower costs per acre would be more attractive to potential developers. It also helped identify properties of lower value within a defined context, such as East Washington between Blair and the Yahara River, since it provided affordability information of specific parcels relative to those in its immediate surroundings. This factor was highly variable depending on location and therefore could not be used to compare value information between locations. For example, property values per acre at the Capitol Square were much higher than those along South Park Street corridor.

Vacancy of Commercial Properties: This was evaluated when data was available. Fully-leased properties are generally profitable and unlikely to be redeveloped in the near future. Alternately, largely vacant properties are more subject to change. Data was gathered from online commercial real estate listings, which provided some information about specific parcels but not a complete picture about vacancy along the corridors. It also did not provide information addressing how long a building has been vacant.

Ownership Patterns: Ownership patterns of abutting parcels were investigated to see if properties were being assembled for a larger development site. Property tax delinquency was also evaluated; however, very few instances of delinquency greater than two years were reported by the Dane County Treasures office.

Infill and Redevelopment Assessment Appendix Maps:

Site Selection Factor: Value to Land Ratio

Site Selection Factor: Change in Improvement (2000-2012)

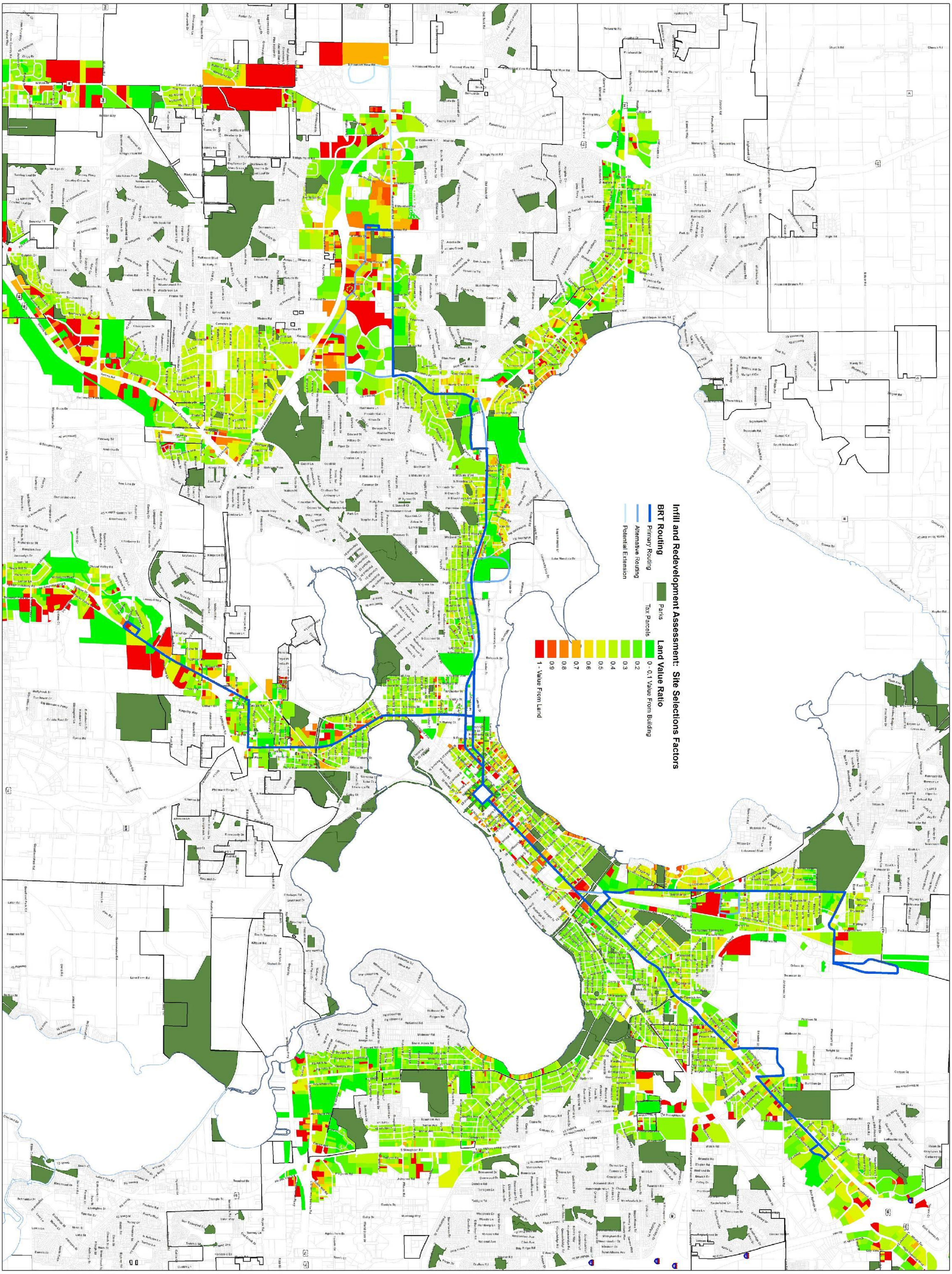
Site Selection Factor: Floor area ratio (FAR)

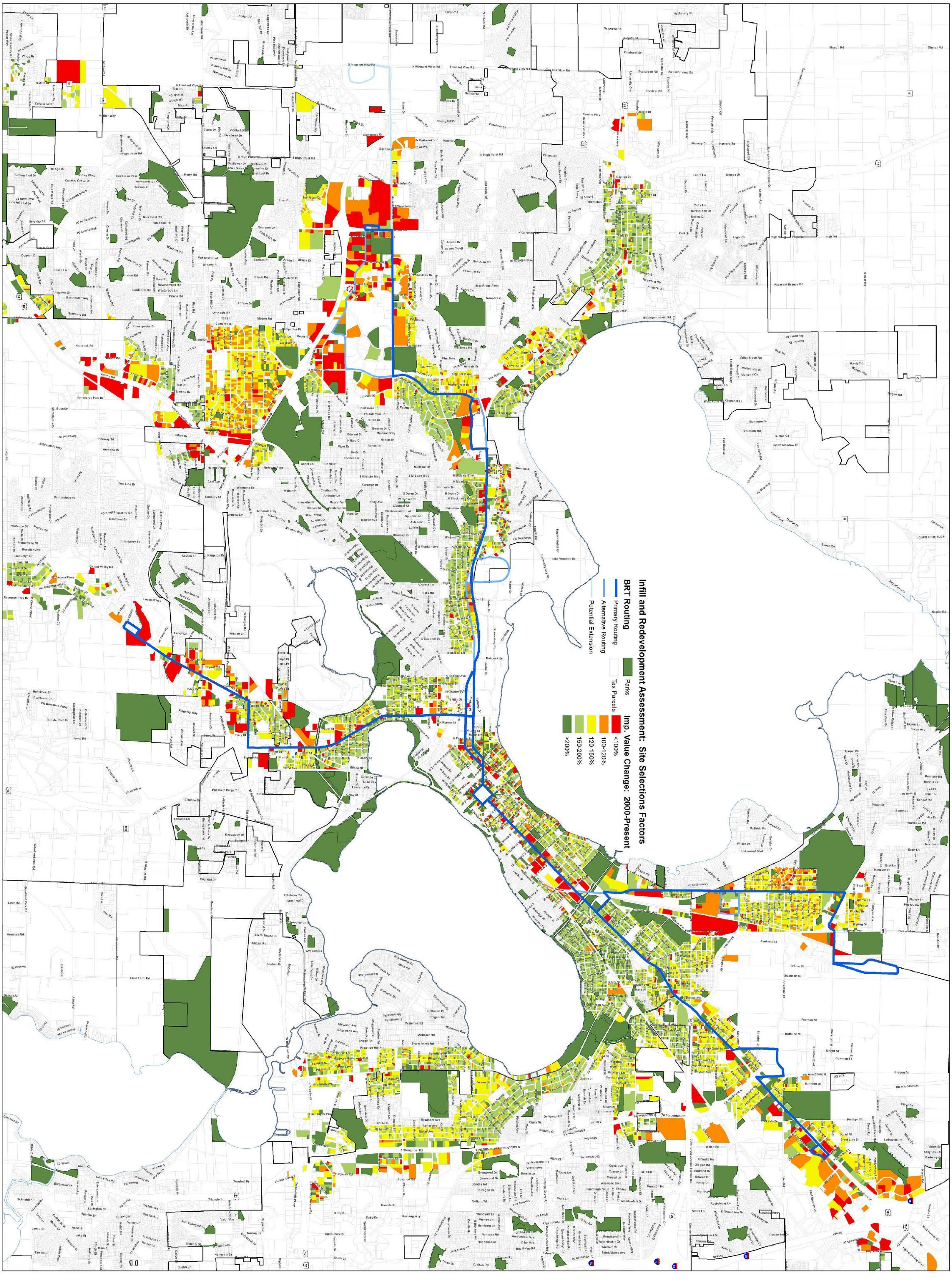
Site Selection Factor: Total Property Value Per Acre

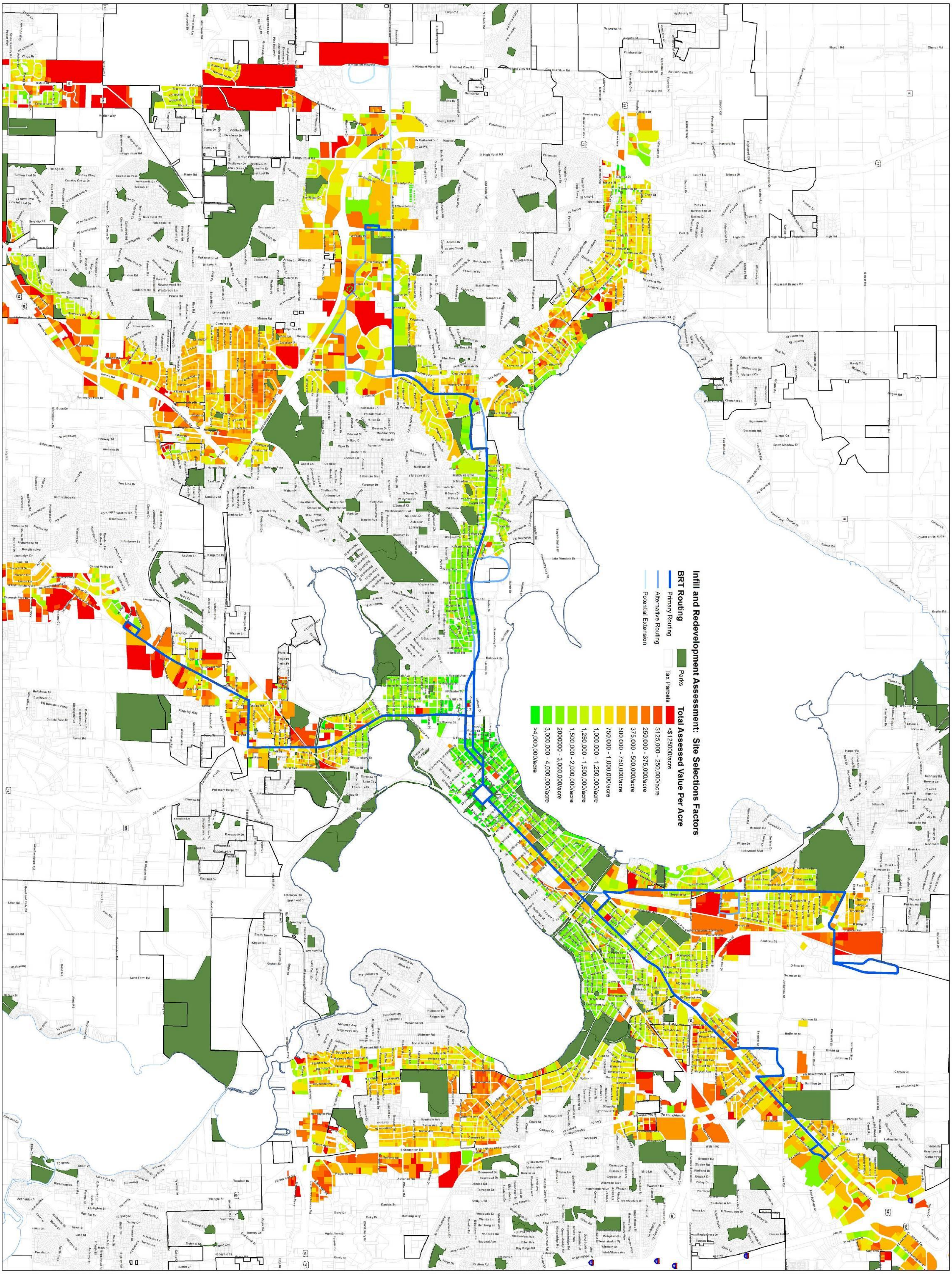
Infill and Redevelopment Sites: System Distribution

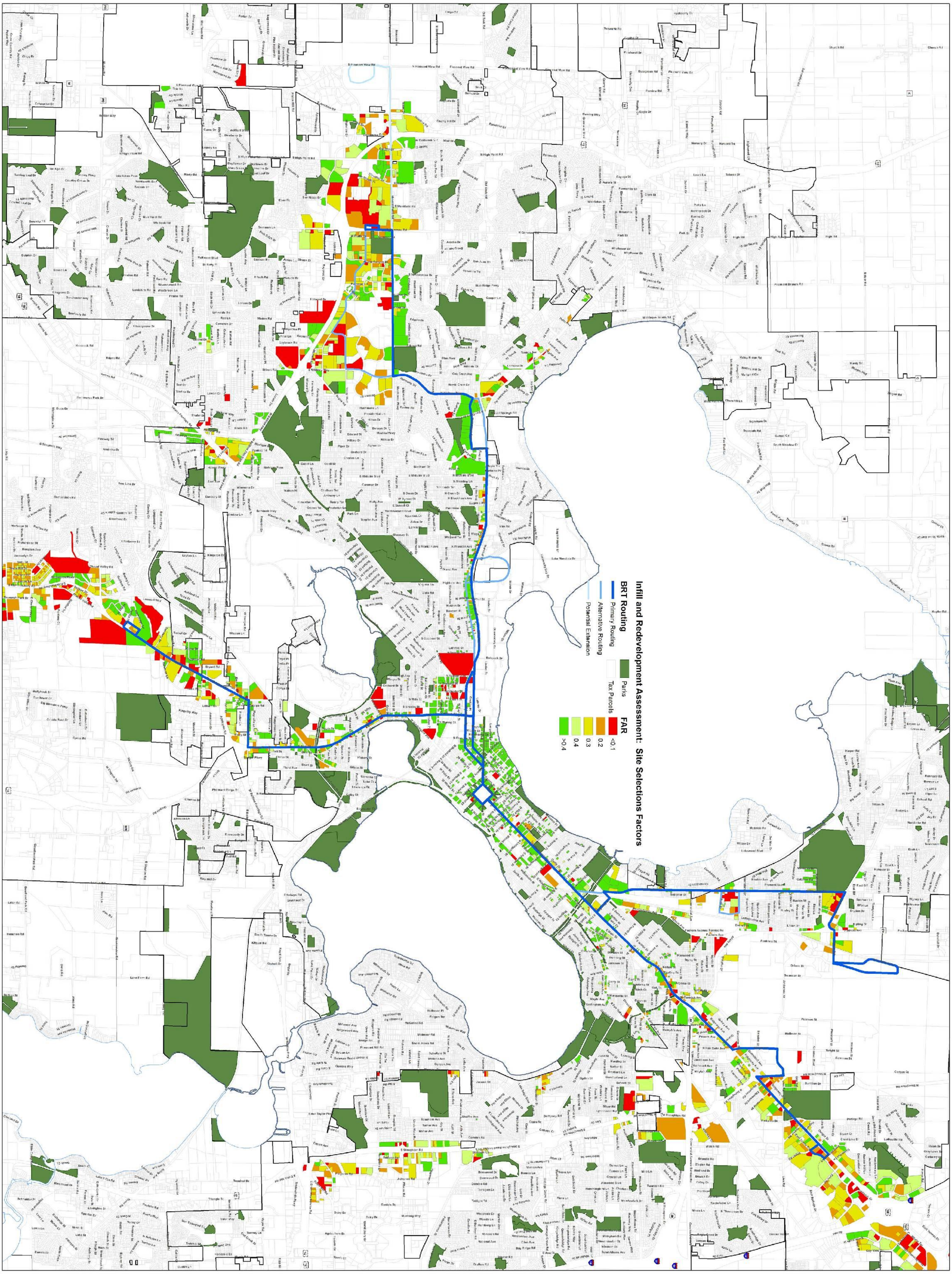
Infill and Redevelopment Sites: East and North Corridors (with building program information)

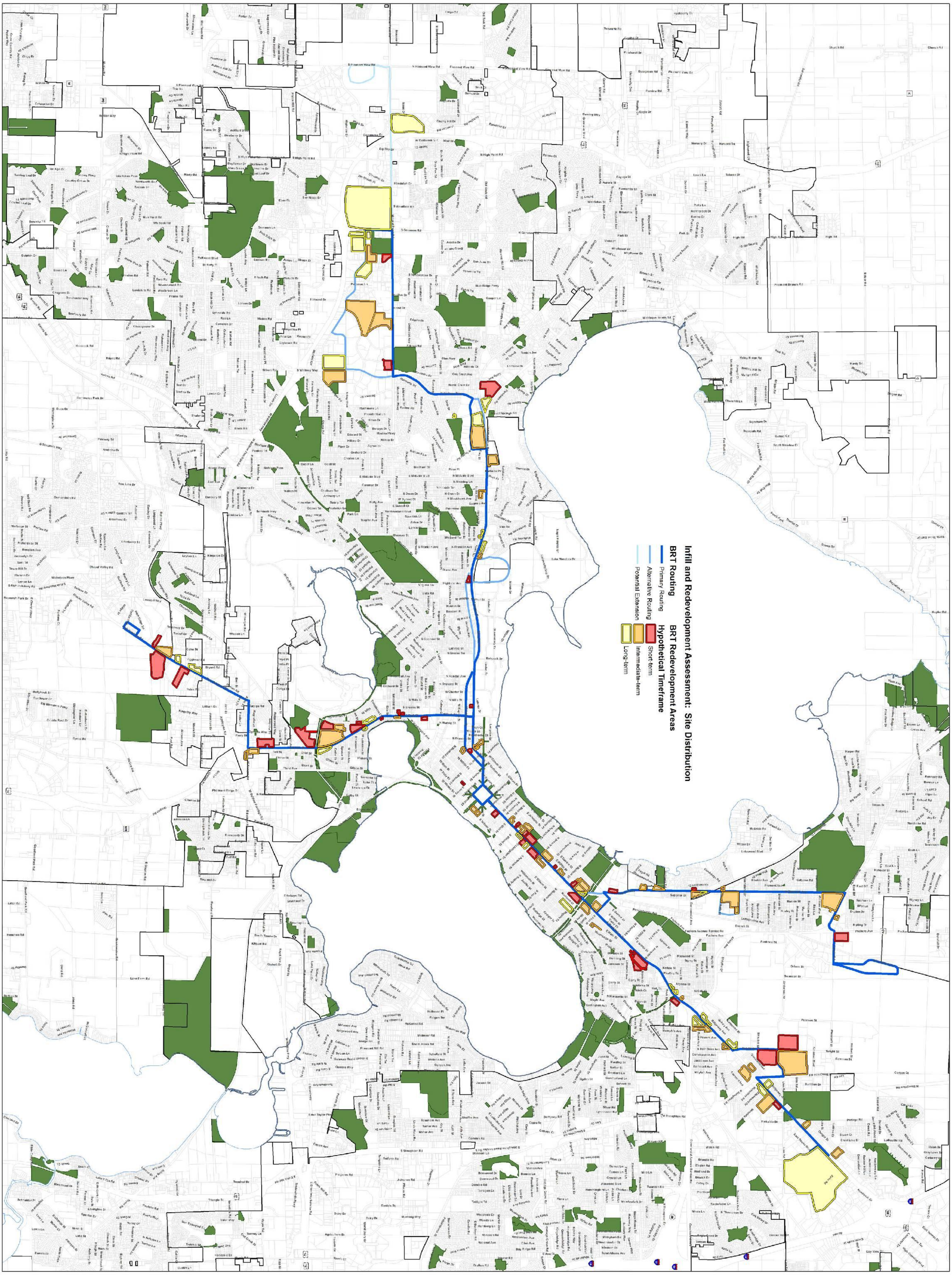
Infill and Redevelopment Sites: West and South Corridors (with building program information)


Infill and Redevelopment Assessment: Site Selections Factors
BRT Routing
Primary Routing
Alternative Routing
Potential Extension
Parks
Tax Parcels
Land Value Ratio
0 - 0.1 Value From Building
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1 - Value From Land

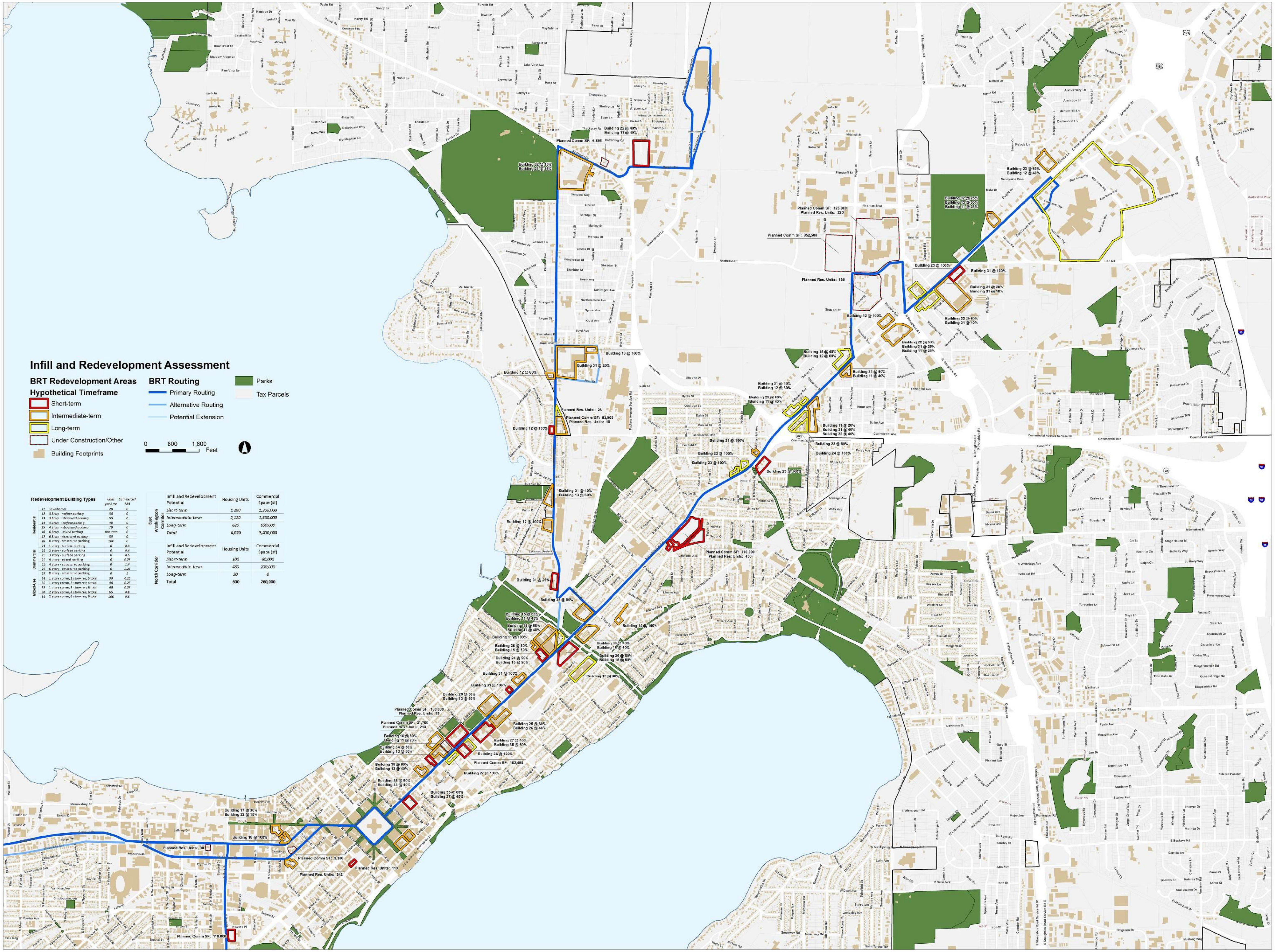

Infill and Redevelopment Assessment: Site Selections Factors
BRT Routing
Primary Routing
Alternative Routing
Potential Extension
Parks
Tax Parcels
Imp. Value Change: 2000-Present
<100%
100-120%
120-150%
150-200%
>200%


Infill and Redevelopment Assessment: Site Selections Factors
BRT Routing
Primary Routing
Alternative Routing
Potential Extension
Parks
Tax Parcels
Total Assessed Value Per Acre
<$125000/acre
$125,000 - 250,000/acre
250,000 - 375,000/acre
375,000 - 500,000/acre
500,000 - 750,000/acre
750,000 - 1,000,000/acre
1,000,000 - 1,250,000/acre
1,250,000 - 1,500,000/acre
1,500,000 - 2,000,000/acre
2000000 - 3,000,000/acre
3,000,000 - 4,000,000/acre
>4,000,000/acre


Infill and Redevelopment Assessment: Site Selections Factors
BRT Routing
Primary Routing
Alternative Routing
Potential Extension
Parks
Tax Parcels
FAR
<0.1
0.2
0.3
0.4
>0.4



Infill and Redevelopment Assessment: Site Distribution

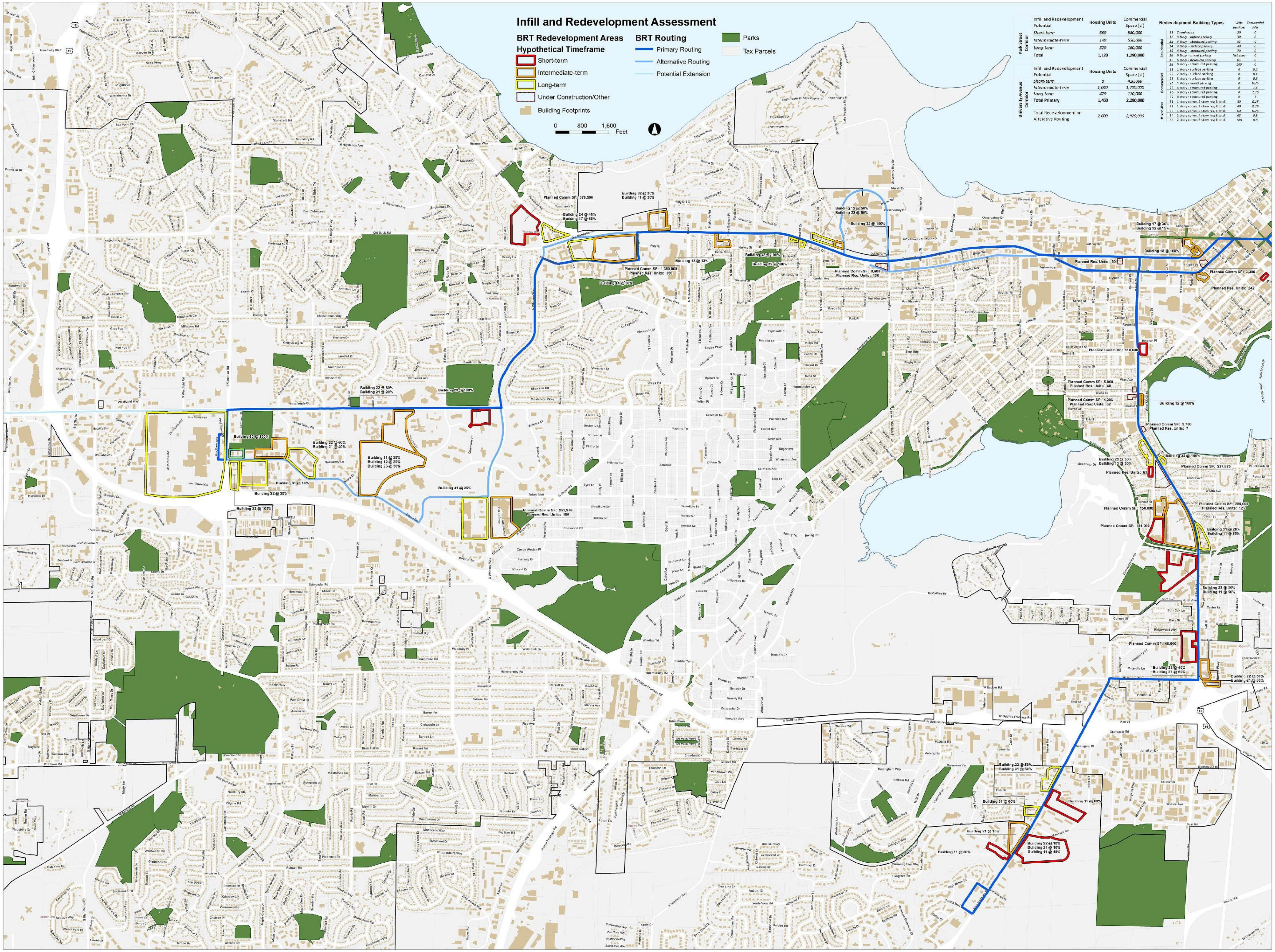


Redevelopment Building Types

			Units per Acre	Commercial FAR
Residential	11	Townhomes	20	0
	12	3 Story - surface parking	30	0
	13	3 Story - structured parking	55	0
	14	4 Story - surface parking	40	0
	15	4 Story - structured parking	70	0
	16	6 Story - mixed parking	Not used	0
	17	6 Story - structured parking	85	0
	18	8 story - structured parking	100	0
Commercial	21	1 story - surface parking	0	0.3
	22	2 story - surface parking	0	0.4
	23	3 story - surface parking	0	0.6
	24	4 story - mixed parking	0	0.75
	25	4 story - structured parking	0	1.4
	26	6 story - structured parking	0	2.25
	27	8 story - structured parking	0	3
Mixed-Use	31	1 story comm, 2 story res; 3 total	30	0.25
	32	1 story comm, 3 story res; 4 total	40	0.25
	33	1 story comm, 5 story res; 6 total	60	0.25
	34	2 story comm, 4 story res; 6 total	65	0.8
	35	2 story comm, 6 story res; 8 total	100	0.8

	Infill and Redevelopment Potential	Housing Units	Commercial Space (sf)
East Washington Corridor	*Short-term*	1,280	1,200,000
	Intermediate-term	2,120	1,550,000
	Long-term	620	650,000
	Total	**4,020**	**3,410,000**

	Infill and Redevelopment Potential	Housing Units	Commercial Space (sf)
North Corridor	*Short-term*	100	60,000
	Intermediate-term	480	200,000
	Long-term	**20**	**0**
	Total	600	260,000



	Infill and Redevelopment Potential	Housing Units	Commercial Space (sf)
Park Street Corridor	*Short-term*	*660*	*580,000*
	Intermediate-term	*140*	*550,000*
	Long-term	*320*	*160,000*
	Total	1,120	1,290,000

	Infill and Redevelopment Potential	Housing Units	Commercial Space (sf)
University Avenue Corridor	*Short-term*	*0*	*410,000*
	Intermediate-term	*1,040*	*1,700,000*
	Long-term	*420*	*170,000*
	Total Primary	**1,460**	**2,280,000**
	Total Redevelopment on Alterative Routing	*2,600*	*2,920,000*

Redevelopment Building Types

			Units per Acre	Commercial FAR
Residential	11	Townhomes	20	0
	12	3 Story - surface parking	30	0
	13	3 Story - structured parking	55	0
	14	4 Story - surface parking	40	0
	15	4 Story - structured parking	70	0
	16	5 Story - mixed parking	Not used	0
	17	5 Story - structured parking	85	0
	18	8 story - structured parking	100	0
Commercial	21	1 story - surface parking	0	0.3
	22	2 story - surface parking	0	0.4
	23	3 story - surface parking	0	0.6
	24	4 story - mixed parking	0	0.75
	25	4 story - structured parking	0	1.4
	26	6 story - structured parking	0	2.25
	27	8 story - structured parking	0	3
Mixed-Use	31	1 story comm, 2 story res; 3 total	30	0.25
	32	1 story comm, 3 story res; 4 total	40	0.25
	33	1 story comm, 5 story res; 6 total	60	0.25
	34	2 story comm, 4 story res; 6 total	65	0.8
	35	2 story comm, 6 story res; 8 total	100	0.8

Madison BRT
Walnut St. Station Constraints

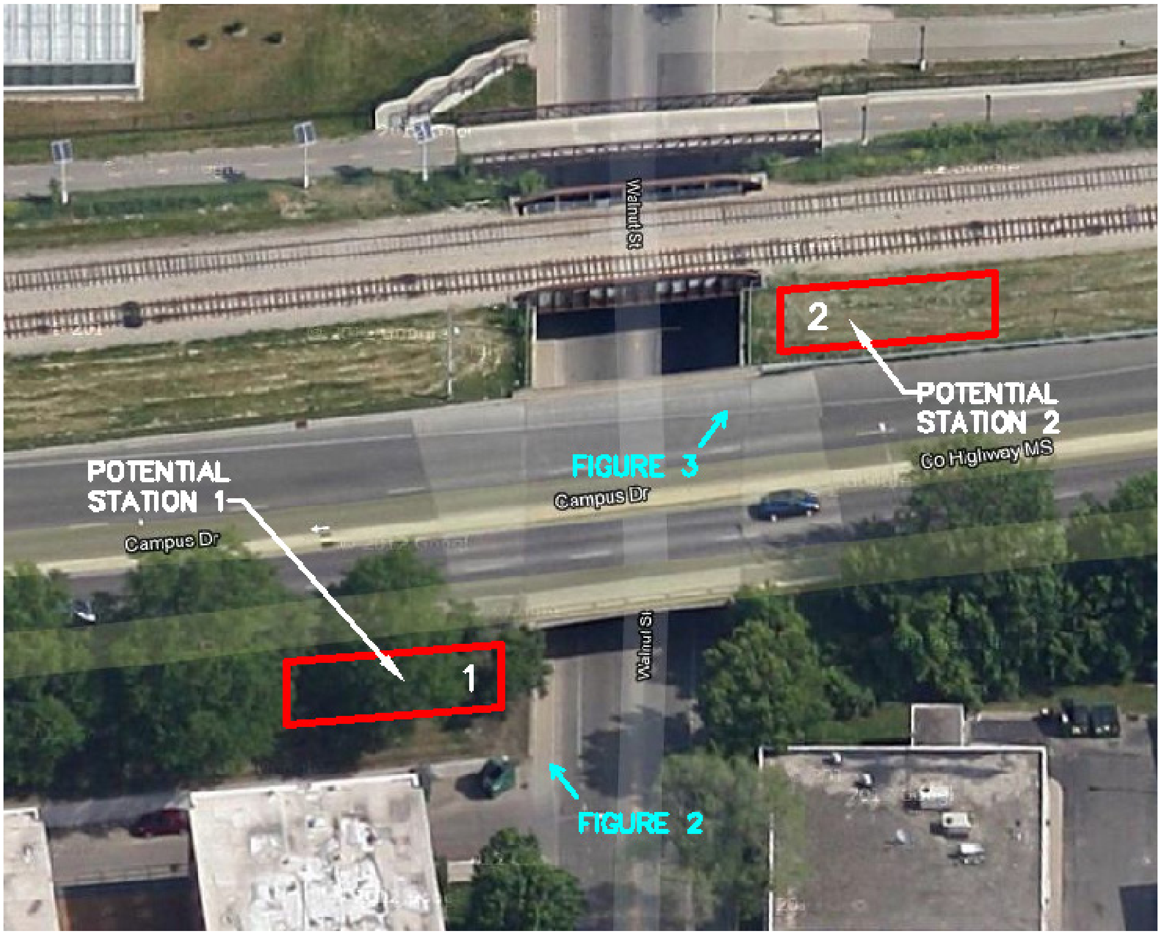


Figure 1: Walnut St./Campus Dr. Intersection

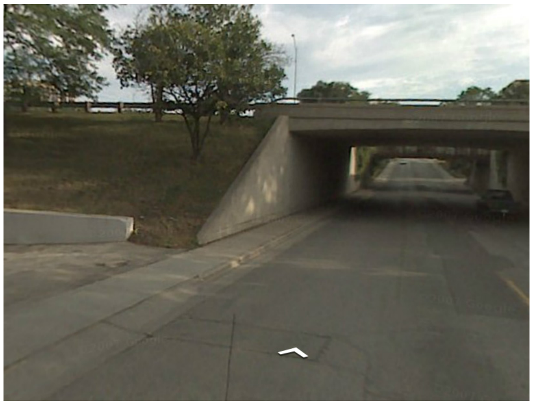


Figure 2: Grade Separation (shows the elevation view of the grade separation between these two roadways)

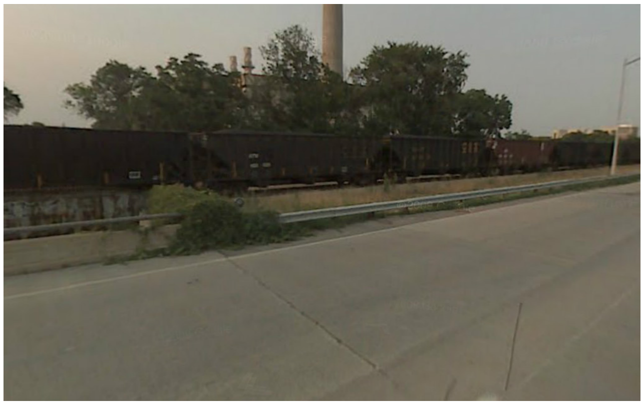


Figure 3: Potential Station Location 2 (elevation view of the potential bus location and the limited space that is available between the existing railroad and Campus Dr.)

Walnut Street Station Constraints

- Campus Dr. is currently grade separated from Walnut St. and runs parallel to an existing railroad and bike path, limiting the amount of ROW available to construction BRT Station 2.

- This section of the BRT route is identified to run in mixed traffic. Construction of a station at this location would require construction of a pullout to minimize impacts to traffic on Campus Dr., which currently operates at a 40 mph speed limit. Construction of a pullout would have an impact on the existing ROW available between the roadway and existing railroad tracks to construct a station.

- Currently there is no sidewalk access within a reasonable distance from the potential station along Campus Dr. In order to allow pedestrians access to this station location, there would be a substantial amount of civil work necessary along Campus Dr.

- BRT Station 1 sits on a severely sloped parcel of land including significant vegetation. The incorporation of a station would require a substantial amount of earthwork and vegetation removal adjacent to the roadway, potentially resulting in higher noise levels for residents. This would also include significant structural work, including retaining walls to support the proposed station.

- One option to provide safe pedestrian access to Station 1 and Station 2 includes construction of an elevator/stair tower to provide vertical circulation down to Walnut St. to allow pedestrians to move between Walnut St. and Campus Dr. Construction of the elevator/stair tower would likely require modifications to the existing bridge abutment to accommodate the elevator/stair tower.

- Alternatively, vertical circulation could be provided with ramps connecting Walnut Street to the BRT stations. This would require significantly long ramps at grades that cannot exceed 5% due to ADA compliance and the pedestrian path would be long and circuitous (See Figure 4).

- A second option to provide pedestrian access to Station 1 and Station 2 includes construction an elevator/stair tower at both station locations (stations would need to be located on the same side of the bridge) and a pedestrian bridge across Campus Dr. and the existing railroad. Vertical circulation between Station 1 and Walnut St. may also be required at the BRT Station 1 in order to accommodate pedestrian movements south of Campus Dr.

- Both alternatives would require a larger BRT station footprint than currently identified in the BRT study to provide sufficient space for the elevator and stairs. The additional space that is required would likely encroach into the railroad ROW.

- Relocation of the existing railroad tracks would require relocation of the existing trail and would be a significant cost to the project.

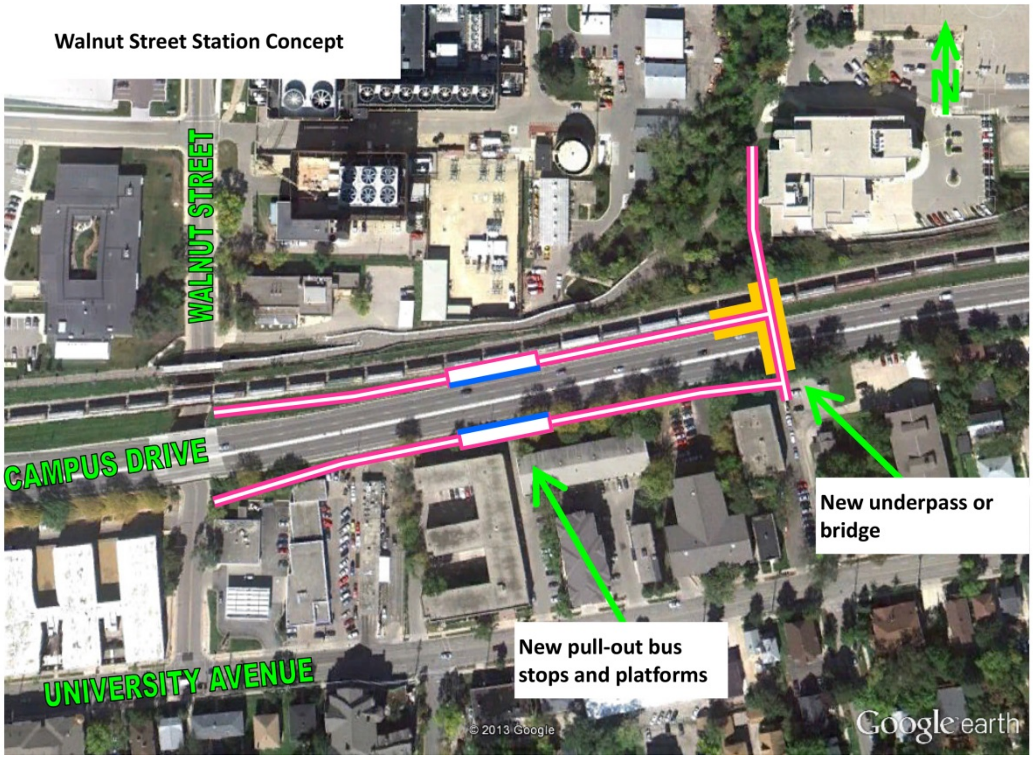
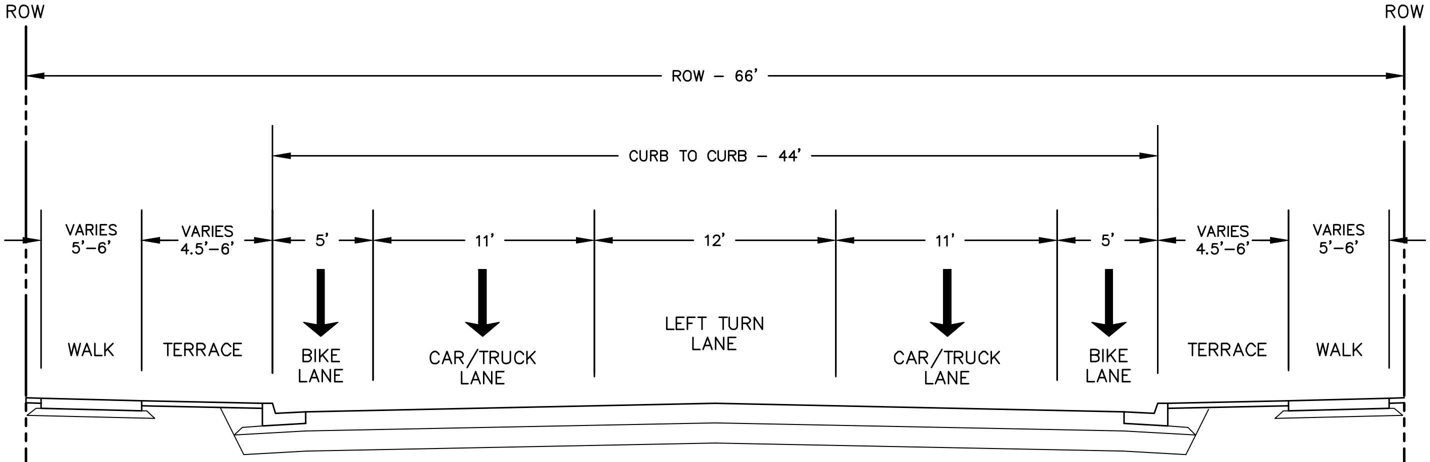


Figure 4: Walnut Street Station Concept

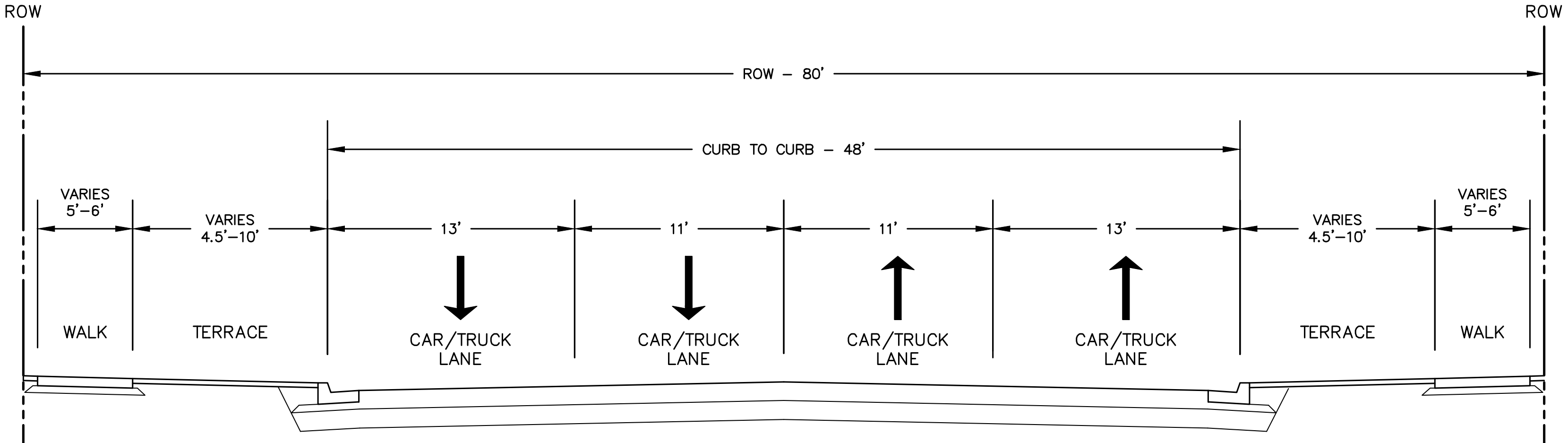
Typical Sections

Mixed Use/Existing Roadway – Sherman Avenue at Aberg Avenue



TYPICAL SECTION ASSUMES THAT THE IMPROVEMENTS IDENTIFIED IN THE
NORTH SHERMAN AVENUE OPERATIONS AND SAFETY ANALYSIS STUDY ARE IMPLEMENTED.

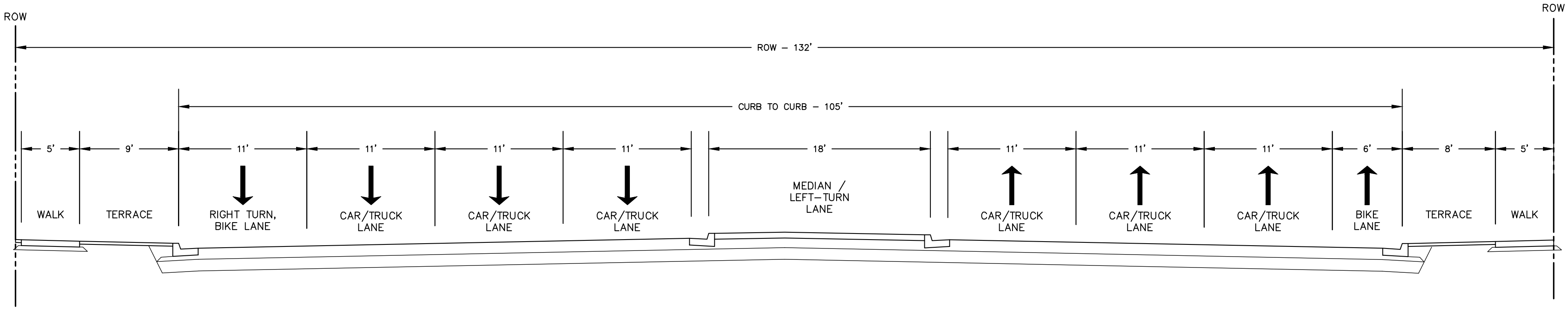
Mixed Use/Existing Roadway – Odana Road at Grand Canyon Drive



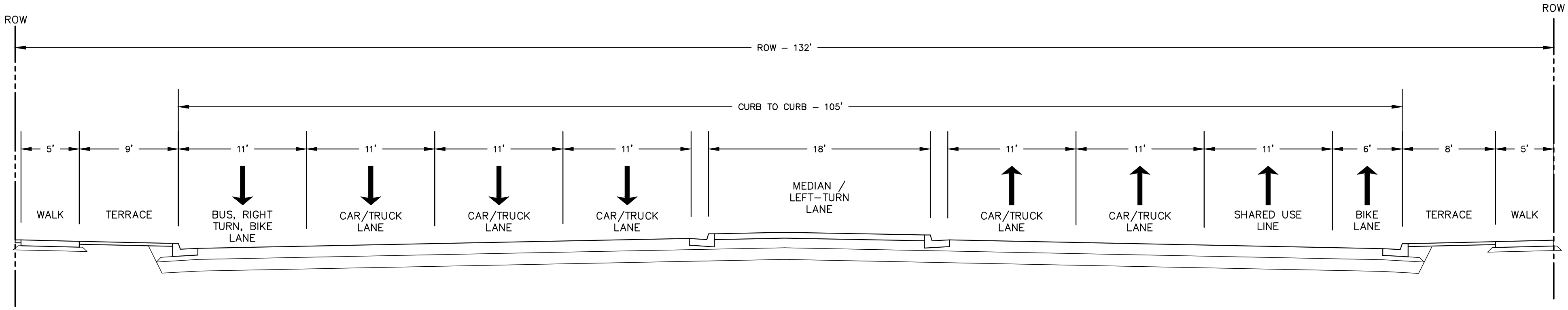
EXTERIOR LANES USED AS MIXED USE (BUS/CAR/TRUCK) LANES IN FUTURE CONDITION

Typical Sections

Existing Roadway – East Washington Avenue at East Johnson Street

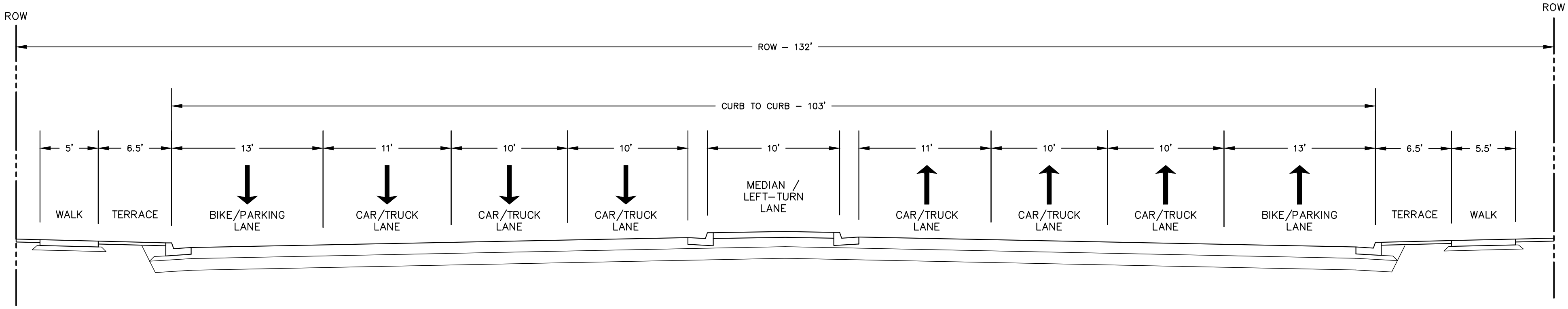


SB Side-Running, NB Mixed Traffic Busway – East Washington Avenue at East Johnson Street

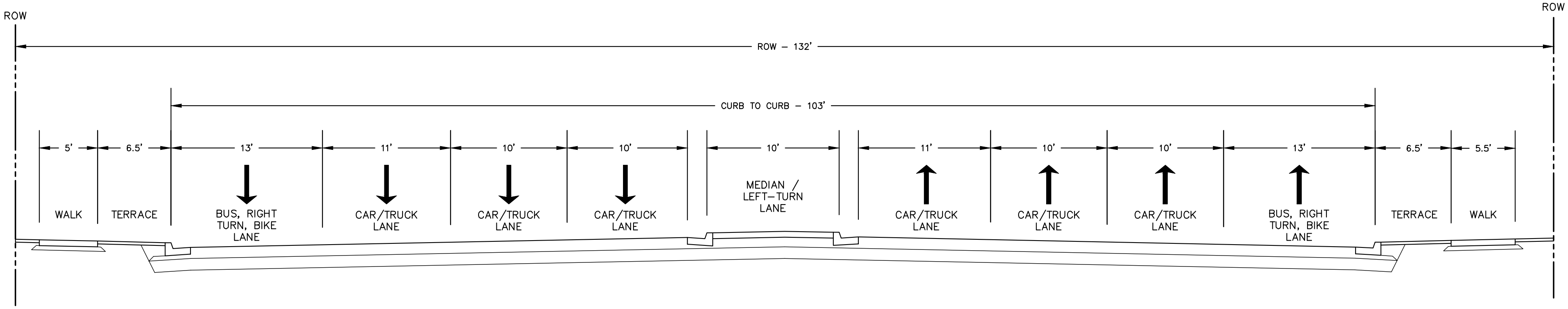


Typical Sections

Existing Roadway – East Washington Avenue at North Baldwin Street

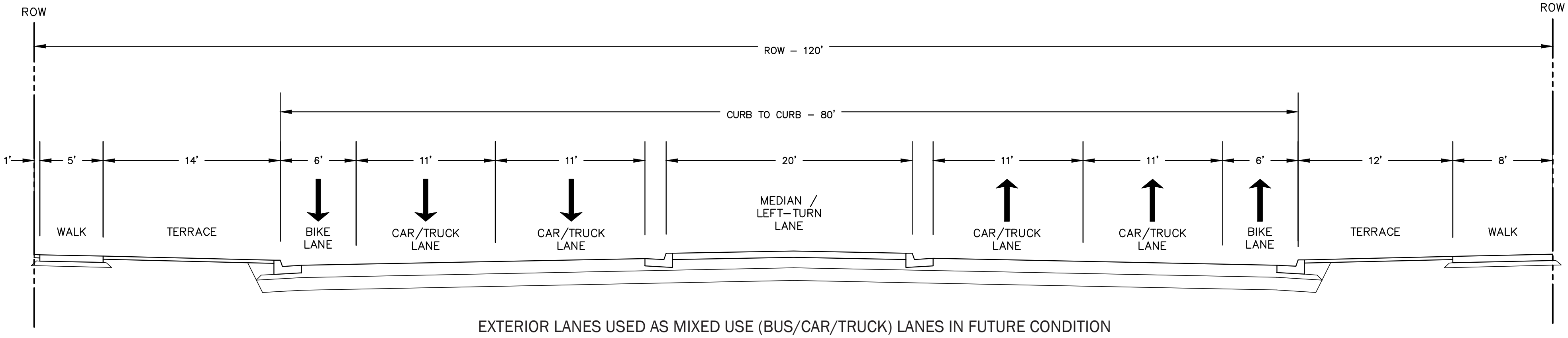


Side-Running Busway – East Washington Avenue at North Baldwin Street



Typical Sections

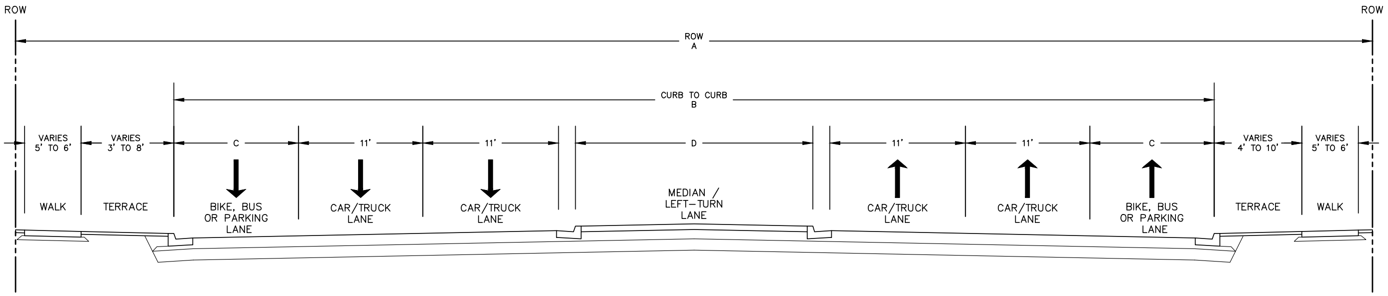
Mixed Use/Existing Roadway – South Park Street at Spring Street



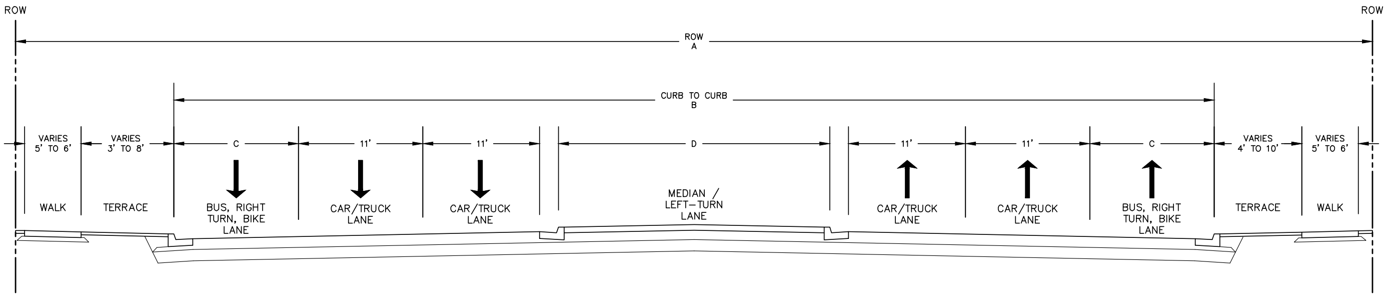
EXTERIOR LANES USED AS MIXED USE (BUS/CAR/TRUCK) LANES IN FUTURE CONDITION

Typical Sections

Existing Roadway – South Park Street at Erin Street, Fish Hatchery Road at Petra Court, Mineral Point Road at Yellowstone Drive, Whitney Way at Regent Street



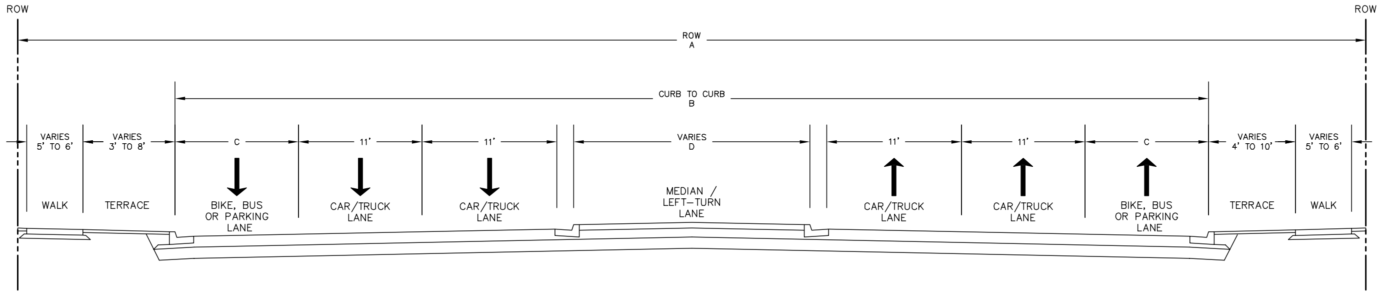
Side-Running Busway – South Park Street at Erin Street, Fish Hatchery Road at Petra Court, Mineral Point Road at Yellowstone Drive, Whitney Way at Regent Street



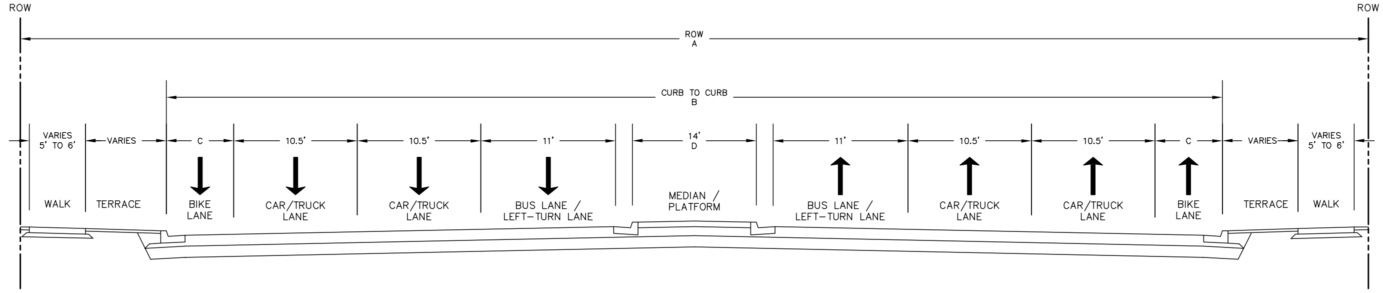
Existing	A	B	C	D
South Park Street at Erin Street	106’	88’	13’	17’ - 18’
Fish Hatchery Road at Petra Court	120’	94’	16’	16.5’
Mineral Point Road at Yellowstone Drive	120’	90’	12.5’	19’ - 23’
Whitney Way at Regent Street	120’	92’	10’	23’ - 24’
Side Running	**A**	**B**	**C**	**D**
South Park Street at Erin Street	106’	88’	13’	17’ - 18’
Fish Hatchery Road at Petra Court	120’	94’	16’	16.5’
Mineral Point Road at Yellowstone Drive	120’	90’	12.5’	19’ - 23’
Whitney Way at Regent Street	120’	92’	10’	23’ - 24’

Typical Sections

Existing Roadway – South Park Street at Erin Street, Fish Hatchery Road at Petra Court, Mineral Point Road at Yellowstone Drive, Whitney Way at Regent Street



Median Busway – South Park Street at Erin Street, Fish Hatchery Road at Petra Court, Mineral Point Road at Yellowstone Drive, Whitney Way at Regent Street

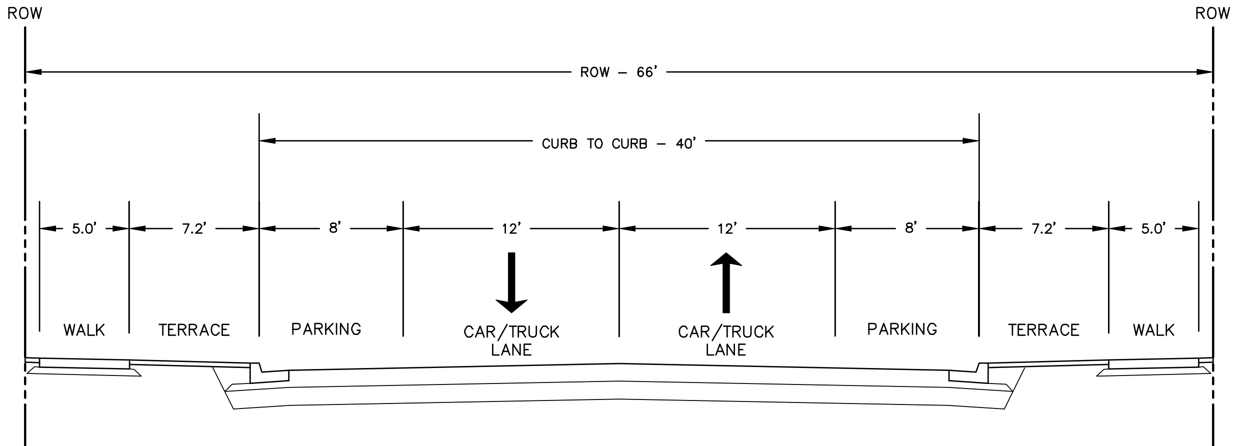


NOTE: PARK STREET REQUIRES WIDENING TO ACCOMMODATE THIS TYPICAL SECTION. MEDIAN NARROWED TO MINIMIZE CONSTRUCTION AND ROW IMPACTS
ADDITIONAL ROW MAY BE REQUIRED AT SIGNALIZED INTERSECTIONS TO ACCOMMODATE SEPARATE LEFT TURN LANES

Existing	A	B	C	D
South Park Street at Erin Street	106’	88’	13’	17’ - 18’
Fish Hatchery Road at Petra Court	120’	94’	16’	16.5’
Mineral Point Road at Yellowstone Drive	120’	90’	12.5’	19’ - 23’
Whitney Way at Regent Street	120’	92’	10’	23’ - 24’
Median Busway	**A**	**B**	**C**	**D**
South Park Street at Erin Street	106’	90'	5’	14’
Fish Hatchery Road at Petra Court	120’	94'	6’	14’
Mineral Point Road at Yellowstone Drive	120’	90'	5’	14’
Whitney Way at Regent Street	120’	92'	5	14’

Typical Sections

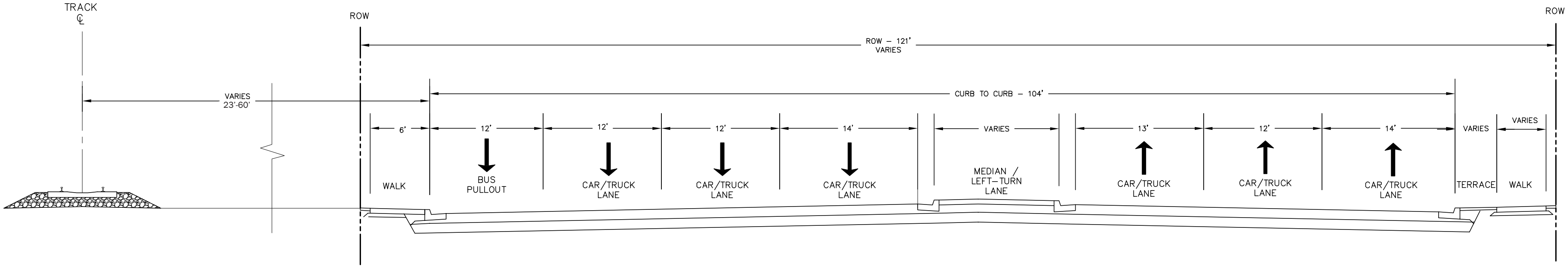
Mixed Use/Existing Roadway – Badger Road at Perry Street



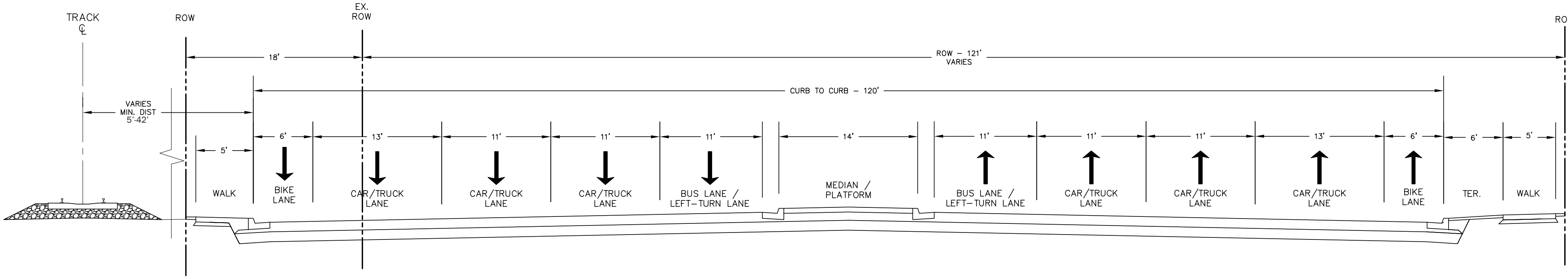
EXTERIOR LANES USED AS MIXED USE (BUS/CAR/TRUCK) LANES IN FUTURE CONDITION

Typical Sections

Existing Roadway – University Avenue at Farley Avenue



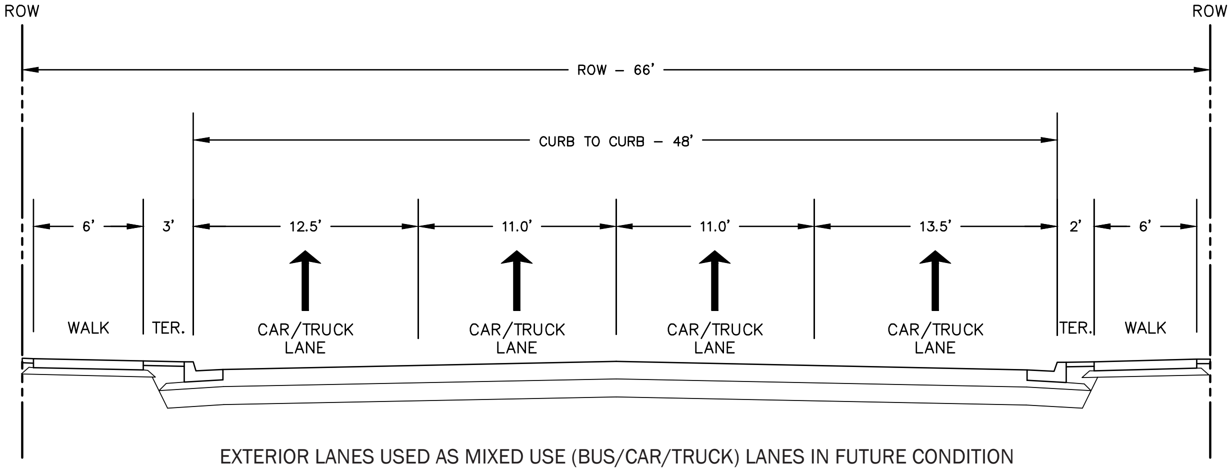
Median Busway – University Avenue at Farley Avenue



NOTE: UNIVERSITY AVENUE REQUIRES ROAD WIDENING AND UP TO 18' OF ADDITIONAL ROW TO ACCOMMODATE THIS TYPICAL SECTION.
EXISTING ROW VARIES THROUGHOUT THIS CORRIDOR.

Typical Sections

Mixed Use/Existing Roadway – West Johnson at Charter Street



EXTERIOR LANES USED AS MIXED USE (BUS/CAR/TRUCK) LANES IN FUTURE CONDITION

Typical Sections

Bus Lane/Existing Roadway – University Avenue at Park Street